

**FINAL REPORT  
MARCH 2001**

**REPORT NO. 00-04**



**MEDIUM TACTICAL VEHICLE REPLACEMENT  
(MTVR)  
TP-94-01, TRANSPORTABILITY TESTING  
PROCEDURES**

Prepared for: Distribution Unlimited

U.S. Army Tank-automotive and Armaments Command  
ATTN: AMSTA-DSA-HT  
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**VALIDATION ENGINEERING DIVISION  
MCALESTER, OKLAHOMA 74501-9053**

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MEDIUM TACTICAL VEHICLE REPLACEMENT (MTVR)  
TP-94-01, TRANSPORTABILITY TESTING PROCEDURES**

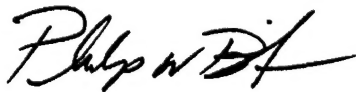
**MARCH 2001**

**ABSTRACT**

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SMAAC-DEV), was tasked to conduct a First Article Test (FAT) on the Medium Tactical Vehicle Replacement (MTVR) Vehicles by the U.S. Army Tank-automotive and Armaments Command (TACOM). The test vehicles were the "Truck, Cargo, 7-ton w/Winch" (Model MK-25) and the "Truck, Cargo, 7-ton, XLWB, w/o Winch" (Model MK-27) manufactured by Oshkosh Truck Corporation, Oshkosh, WI. The Truck, Cargo, 7-ton w/Winch (Model MK-25) and the Truck, Cargo, 7-ton, XLWB, w/o Winch (Model MK-27) were tested in accordance with TP-94-01, "Transportability Testing Procedures." The satisfactory performance of the Truck, Cargo, 7-ton w/Winch (Model MK-25) and the Truck, Cargo, 7-ton, XLWB, w/o Winch (Model MK-27) during testing has demonstrated that they are adequate to transport up to 7 tons of ammunition by all surface modes and up to 15 tons of ammunition during on-road transport.

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REPORT NO. 00-04

MEDIUM TACTICAL VEHICLE REPLACEMENT (MTVR)  
TP-94-01, Transportability Testing Procedures

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## **PART 1 – INTRODUCTION**

**A. BACKGROUND.** The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SMAAC-DEV), was tasked to conduct a First Article Test (FAT) on the Medium Tactical Vehicle Replacement (MTVR) Vehicles by the U.S. Army Tank-automotive and Armaments Command (TACOM). The test vehicles were the "Truck, Cargo, 7-ton w/Winch" (Model MK-25) and the "Truck, Cargo, 7-ton, XLWB, w/o Winch" (Model MK-27) manufactured by Oshkosh Truck Corporation, Oshkosh, WI.

**B. AUTHORITY.** This test was conducted IAW mission responsibilities delegated by the U.S. Army Operations Support Command (OSC), Rock Island, IL. Reference is made to the following:

1. Change 6, AR 740-1, 18 August 1976, Storage and Supply Activity Operation.
2. IOC-R, 10-23, Mission and Major Functions of USADAC, 7 January 1998.

**C. OBJECTIVE.** The objective of the tests was to determine if the Medium Tactical Vehicle Replacement Vehicles (Truck, Cargo, 7-ton w/Winch" (Model MK-25) and the "Truck, Cargo, 7-ton, XLWB, w/o Winch"(Model MK-27) manufactured by Oshkosh Truck Corporation satisfied the transportability requirements of TP-94-01.

**D. CONCLUSION.** The Truck, Cargo, 7-ton w/Winch (Model MK-25) and the Truck, Cargo, 7-ton, XLWB, w/o Winch (Model MK-27) were tested in accordance with TP-94-01, "Transportability Testing Procedures." The satisfactory performance of the Truck, Cargo, 7-ton w/winch (Model MK-25) and the Truck, Cargo, 7-ton, XLWB, w/o Winch (Model MK-27) during testing has demonstrated that they are adequate to transport up to 7 tons of ammunition by all surface modes and up to 15 tons of ammunition during on-road transport.

## **PART 2 - ATTENDEES**

DATES PERFORMED: 29 February – 5 September 2000

### **ATTENDEE**

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### **PART 3 - TEST EQUIPMENT**

A. Truck, Cargo, 7-ton, w/Winch

Model Number: MK-25

Serial Number: 067032

Dimensions: Height – 141.2 inches

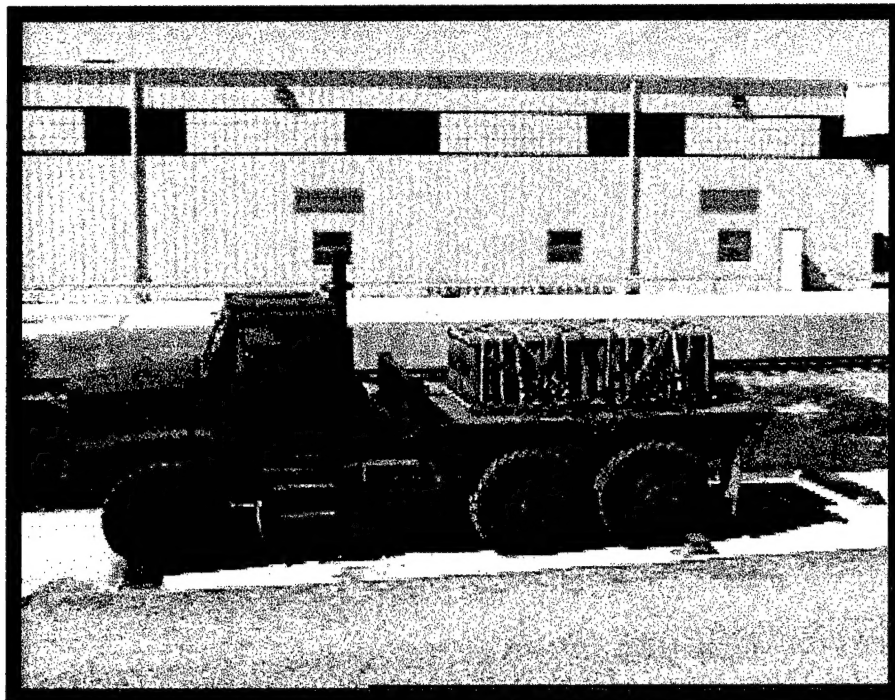
Width – 98 inches

Length – 315 inches

Empty Weight: 27, 480 pounds (as tested)

Payload: On Road – 0 – 30,000 pounds

Off Road – 0 – 14,200 pounds



**Hazard course test of MK-25 vehicle with 155MM  
Separate Loading Projectiles (SLPs)**

B. Truck, Cargo, 7-ton, w/o-winch

Model Number: MK-27

Serial Number: 067558

Dimensions: Height –140.7 inches

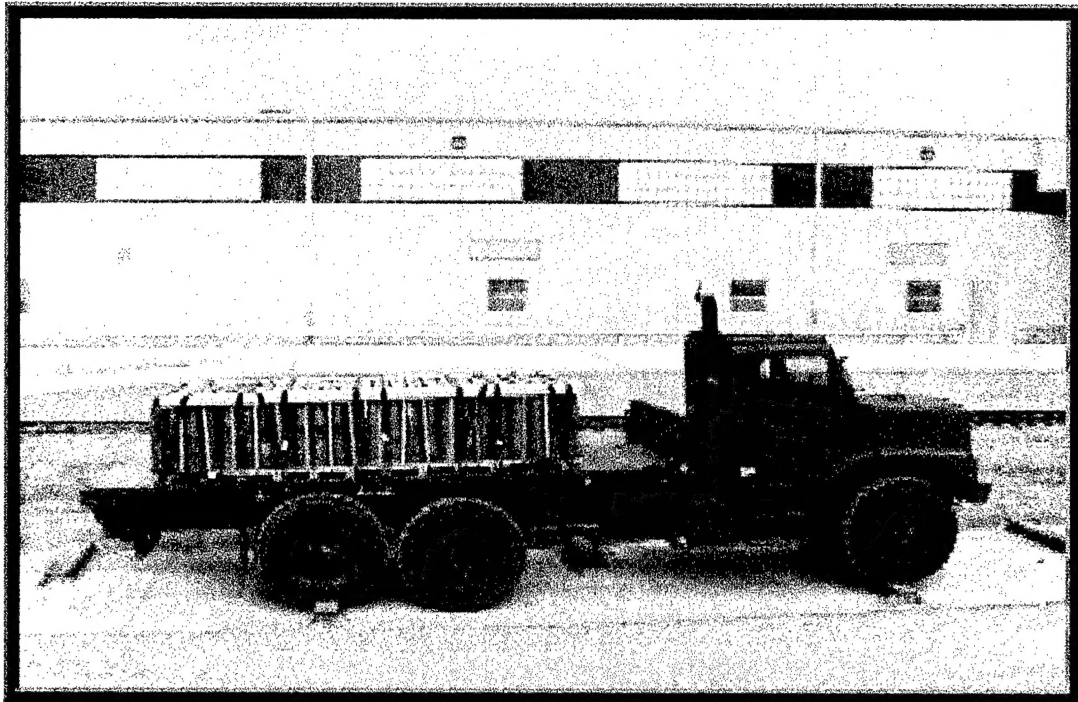
Width – 98 inches

Length – 386.5 inches

Empty Weight: 28, 700 pounds (as tested)

Payload: On Road – 0 – 30,000 pounds

Off Road – 0 –14,200 pounds



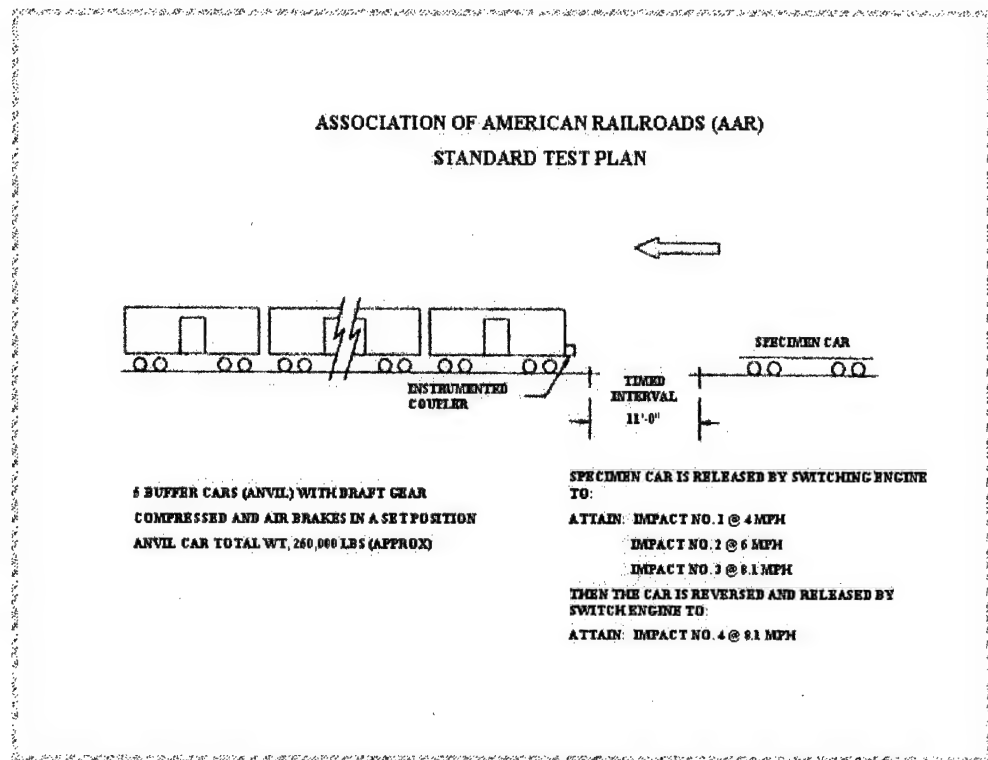
**Hazard course test of MK-27 vehicle during 30,000-pound payload testing**

## **PART 4 - TEST PROCEDURES**

The test procedures outlined in this section were extracted from TP-94-01, "Transportability Testing Procedures," July 1994, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical truck and railcar.

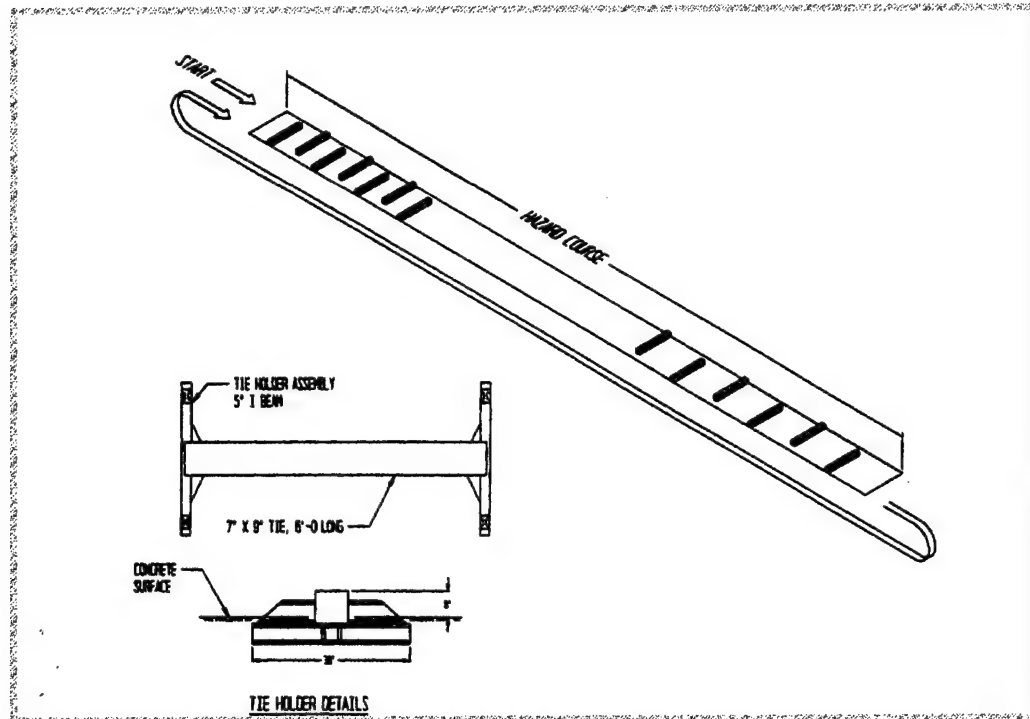
The rail impact test was conducted with the loaded MTVR vehicles secured directly to the railcar. The vehicles were secured to the railcar in accordance with MTMC-TEA Pamphlet 55-19 "Tiedown Handbook for Rail Movements". Inert (non-explosive) items were used to build the load. The test loads were prepared using the blocking and bracing procedures proposed for use with munitions (see Part 6 for procedures). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads were identical to live (explosive) ammunition.

**A. RAIL IMPACT TEST METHOD.** The MTVRs were loaded and secured to a conventional friction draft gear flatcar. Equipment needed to perform the test included the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars were positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit pushed the specimen car toward the anvil at a predetermined speed, then disconnected from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it struck the anvil. This constituted an impact. Impacting was accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The 4 and 6 mph impact speeds were approximate; the 8.1 mph is a minimum. Impact speeds were determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).



**Figure 1. Rail Impact Sketch**

**B. HAZARD COURSE.** The loaded MTRVs were transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course was traversed two times (see Figure 2).



**Figure 2. Hazard Course Sketch**

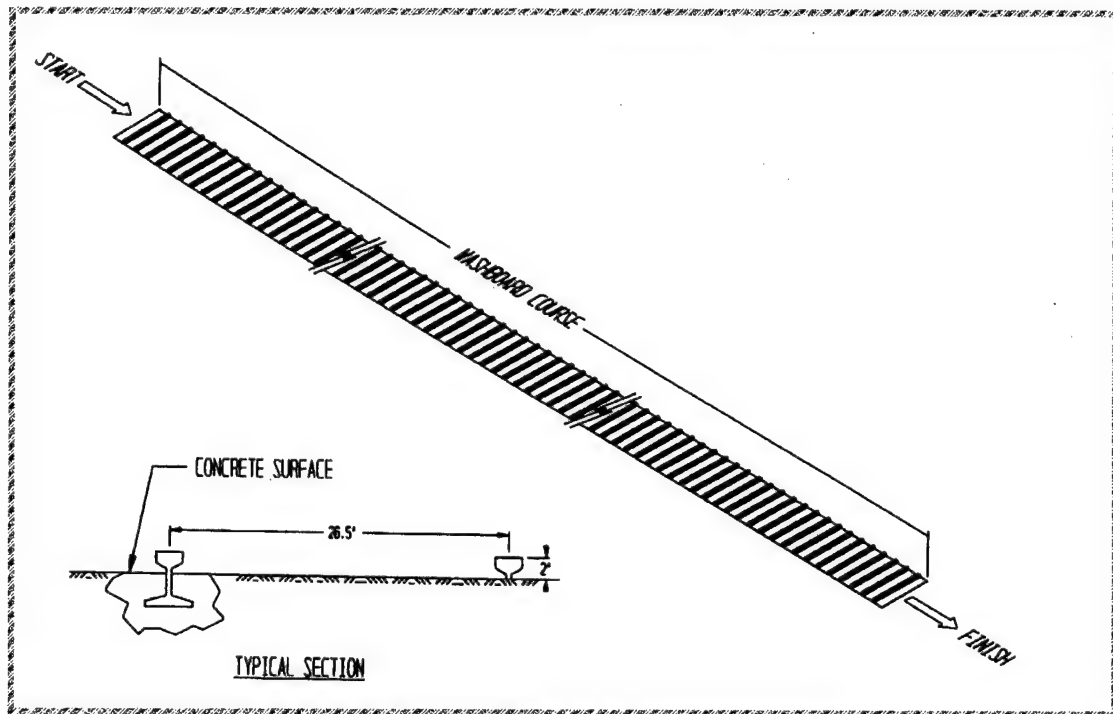
1. The first series of ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.
2. Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.
3. The second series of ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.
4. The test load is driven across the hazard course at speeds that would produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

**C. ROAD TRIP.** The loaded MTRVs were transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete and asphalt. The test route included curves, corners, railroad crossings and stops and starts. The trailers traveled at the maximum speed for the particular road being traversed, except as limited by legal restrictions.



**D. PANIC STOPS.** The MTRVs were subjected to three full airbrake stops while traveling in the forward direction and one in the reverse direction. The first three stops are at 5, 10 and 15 mph in the forward direction and approximately 5 mph in the reverse direction.

**E. WASHBOARD COURSE.** The loaded MTRVs were driven over the washboard course at a speed that produced the most violent response in the vehicles.



**Figure 3. Washboard Course Sketch**

## **PART 5 - TEST RESULTS**

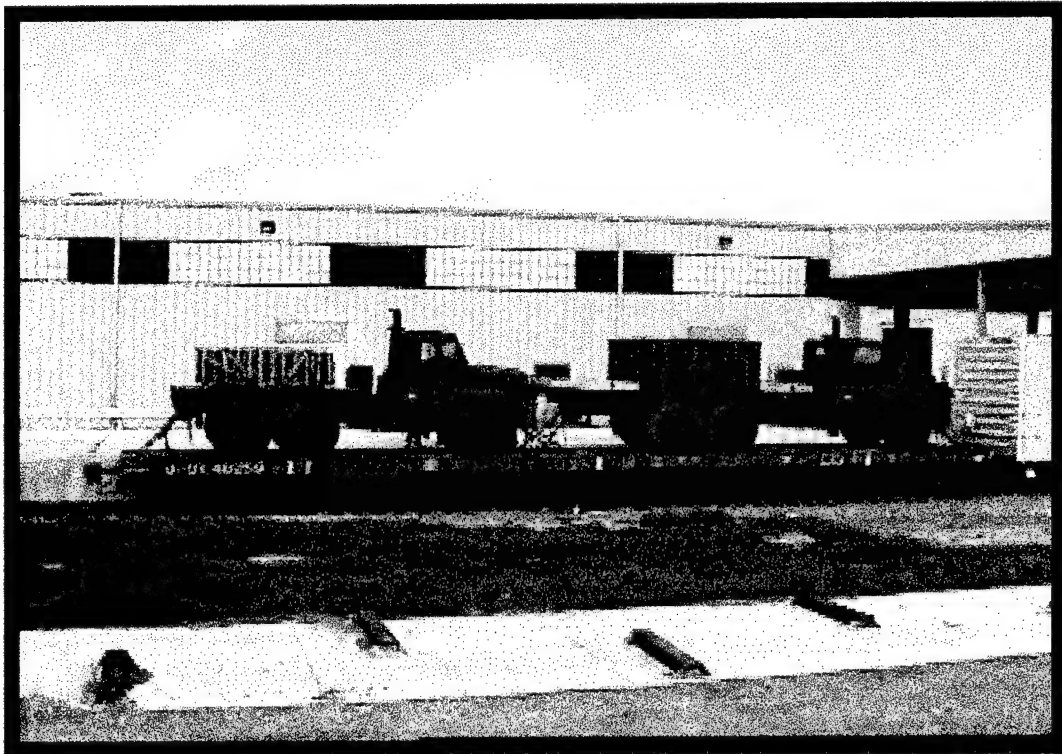
### **5.1. TEST VEHICLE: Truck, Cargo, 7-ton, w/Winch (MK-25)**

**Payload: 155MM Separate Loading Projectiles**

**Payload Weight: 14,120 pounds**

**Date: 29 February 2000 – 1 March 2000**

#### **A. RAIL IMPACT**



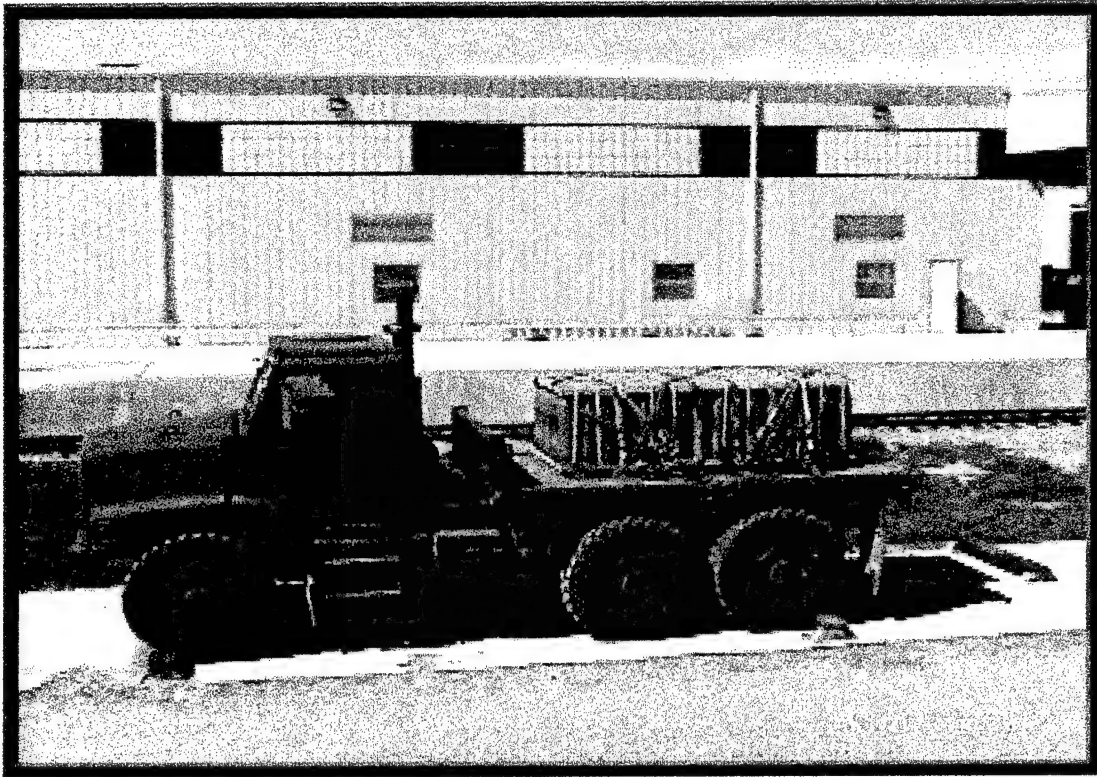
**Rail impact test of MK-25 vehicle with 155MM Separate Loading Projectiles.**

DESCRIPTION	WEIGHT
Flatcar Number: DODX 40259	58,200 lbs.
MK25 (empty)	27,480 lbs.
155MM SLP Payload	14,120 lbs.
MK27 (empty)	28,700 lbs.
120MM Tank Ammunition	15,900 lbs.
Total Specimen Wt.	157,200 lbs.
Buffer Car (four cars)	250,000 lbs.

Impact Number	Velocity (mph)	Remarks
1	3.4	None
2	6.5	None
3	8.1	None
4	8.7	None

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.

## B. HAZARD COURSE



**Hazard course test of MK-25 vehicle with 155MM  
Separate Loading Projectiles (SLPs)**

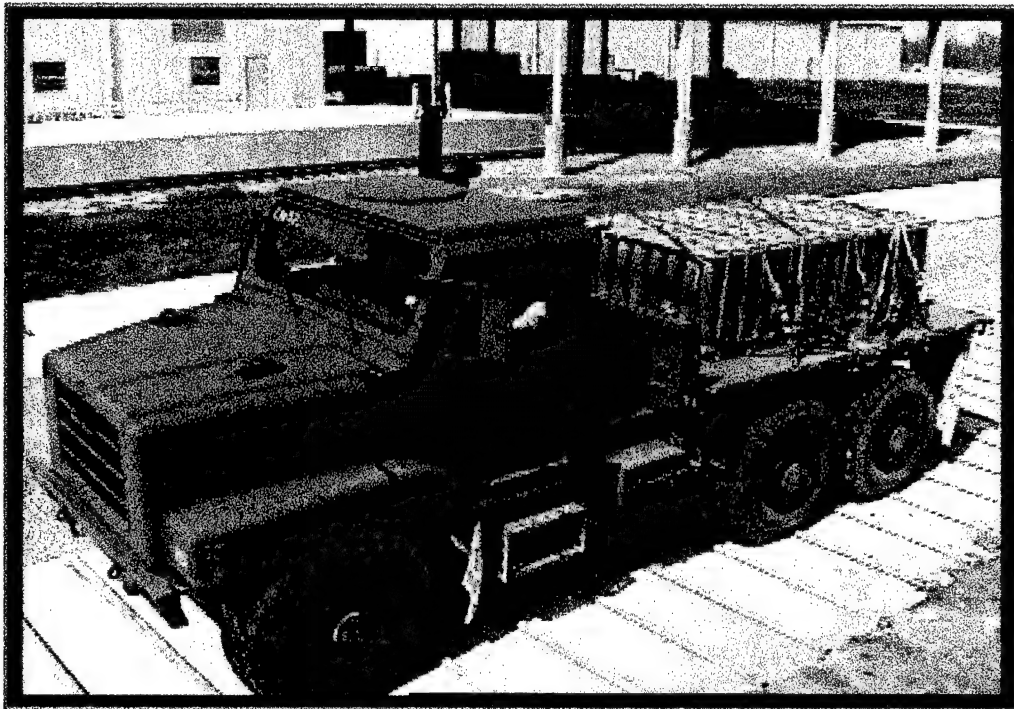
PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	25 Seconds	5.5
2	24 Seconds	5.7
3	25 Seconds	5.5
4	24 Seconds	5.7

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.

**C. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

**D. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.

**E. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.



**Washboard test of MK-25 with 155MM Separate Loading Projectiles**

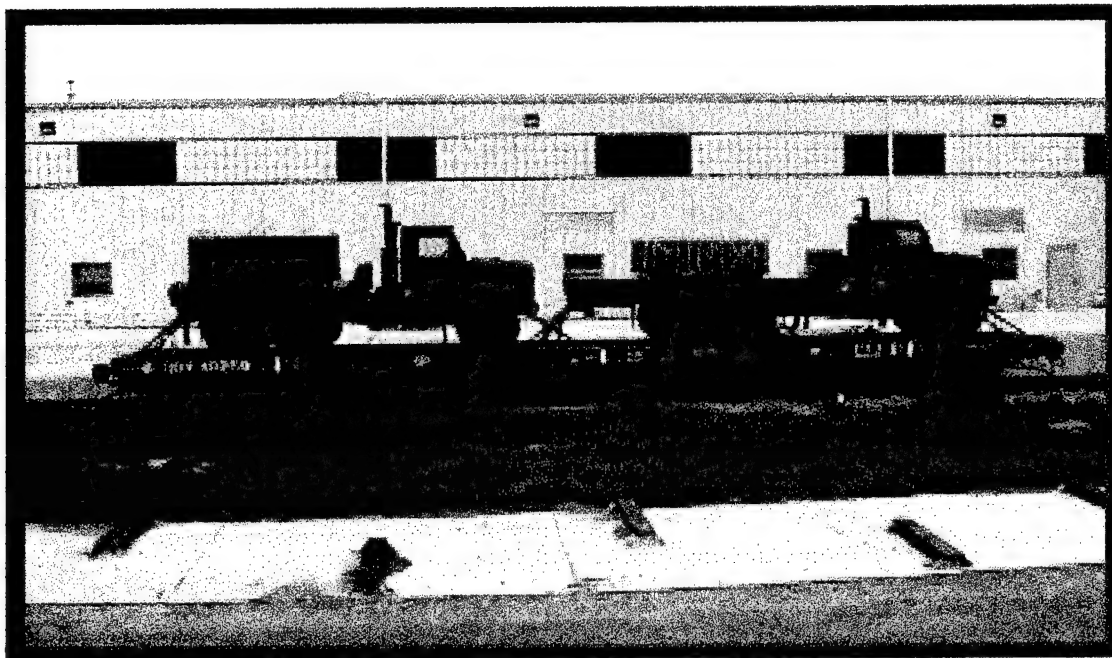
**5.2 TEST VEHICLE:** Truck, Cargo, 7-ton, w/Winch (MK-25)

**Payload:** 120MM Tank Ammunition with metal pallets

**Payload Weight:** 15,500 pounds

**Date:** 14-15 March 2000

**A. RAIL IMPACT**



**Rail Impact test of MK-25 vehicle with 120MM Tank Ammunition**

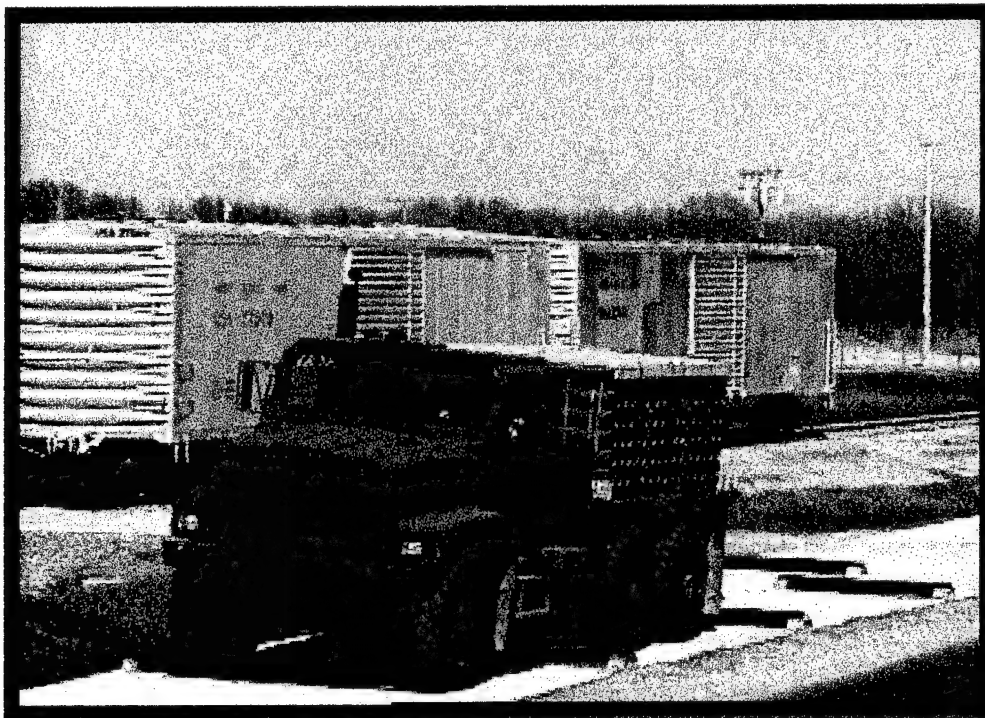
DESCRIPTION	WEIGHT
Flatcar Number: DODX 40259	58,200 lbs.
MK 25 (empty)	27,480 lbs.
120MM Tank Ammunition	15,500 lbs.
MK27 (empty)	28,700 lbs.
155MM SLP Payload	14,120 lbs.
Total Specimen Wt.	144,000 lbs.
Buffer Car (four cars)	250,000 lbs.

Impact Number	Velocity (mph)	Remarks
1	4.9	None
2	5.6	None
3	8.5	None
4	8.3	None

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.



## B. HAZARD COURSE



**Hazard Course test of MK-25 with 120MM Tank Ammunition**

PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	25 Seconds	5.5
2	25 Seconds	5.5
3	25 Seconds	5.5
4	25 Seconds	5.5

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.



**C. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

**D. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.



**Panic Stop of MK-25 vehicle with 120MM Tank Ammunition**

**E. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.



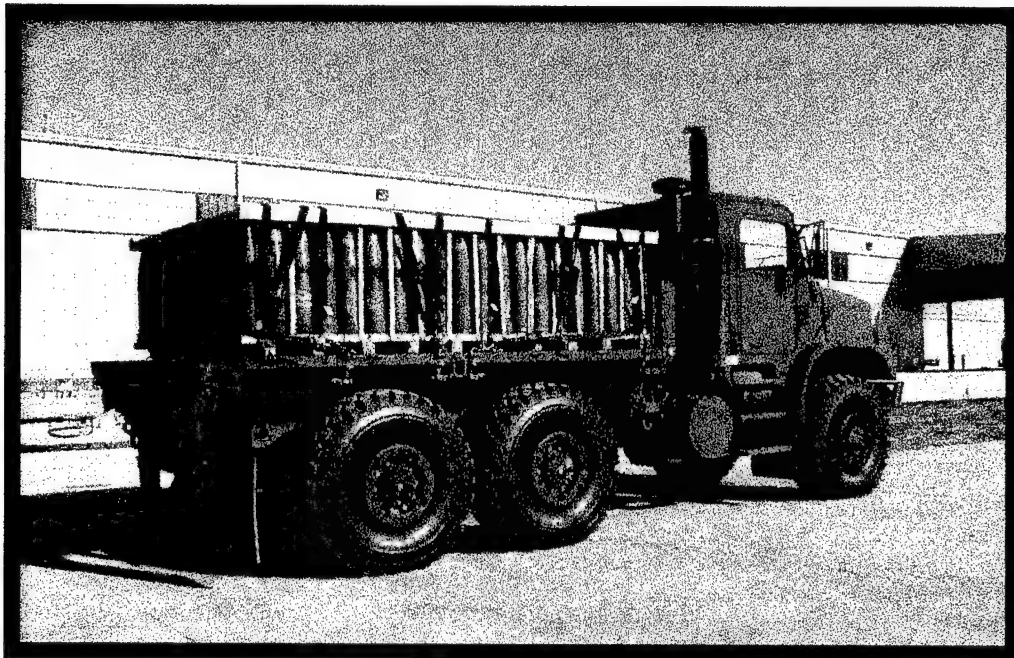
**Washboard test of MK-25 with 120MM Tank Ammunition**

**5.3 TEST VEHICLE:** Truck, Cargo, 7-ton, w/Winch (MK-25)

**Payload:** 155MM Separate Loading Projectiles

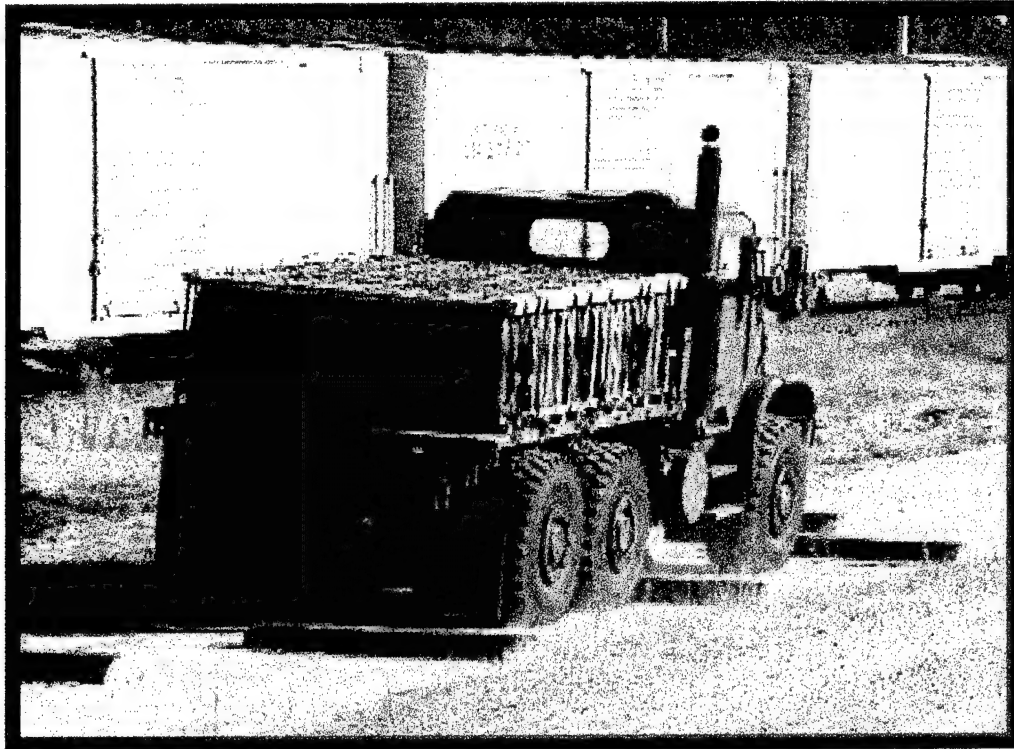
**Payload Weight:** 26,280 pounds (30,000 pound on-road payload could not be reached due to deck space limitations)

**Date:** 29 August 2000



**MK-25 loaded with 26,280 pounds of 155 Separate Loading Projectiles**

## A. HAZARD COURSE



**Hazard course test of MK-25 vehicle with 26,280-pound payload**

PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	20 Seconds	6.8
2	26 Seconds	5.2
3	25 Seconds	5.5
4	23 Seconds	5.9

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.

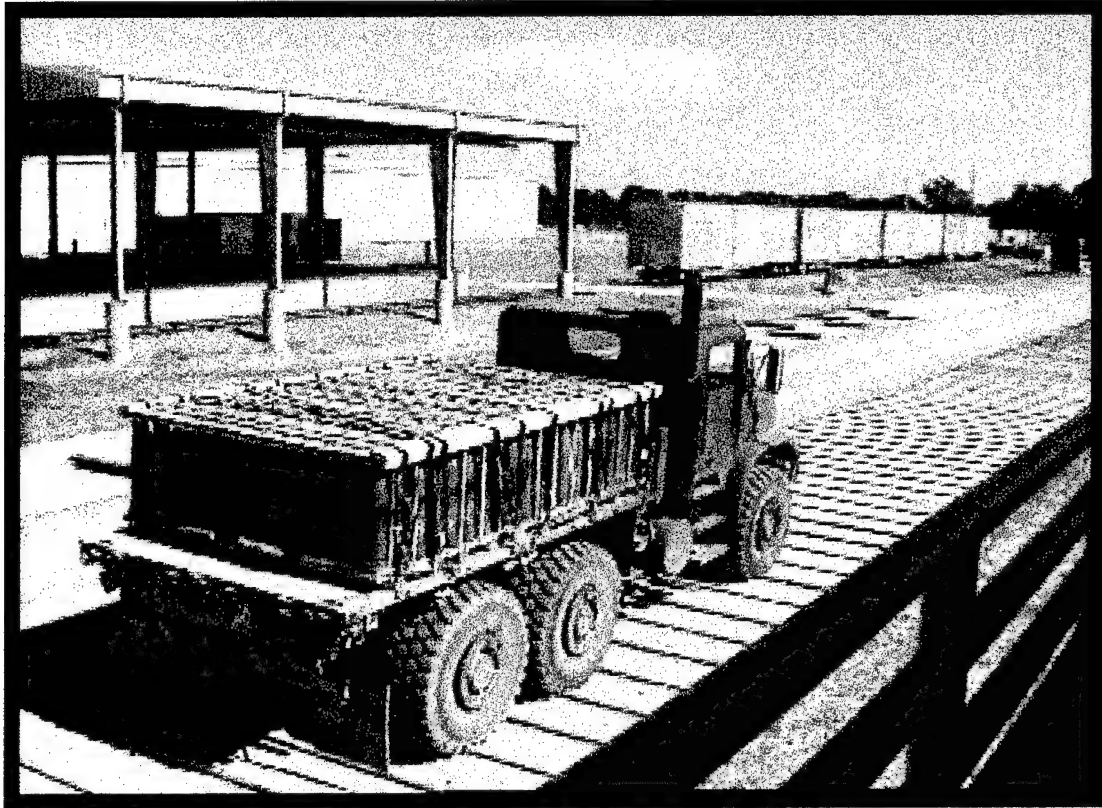
**B. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

**C. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.



**Panic stop of MK-25 vehicle with 26,280-pound payload**

**D. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.



**Washboard course test of MK-25 vehicle with 26,280-pound payload**

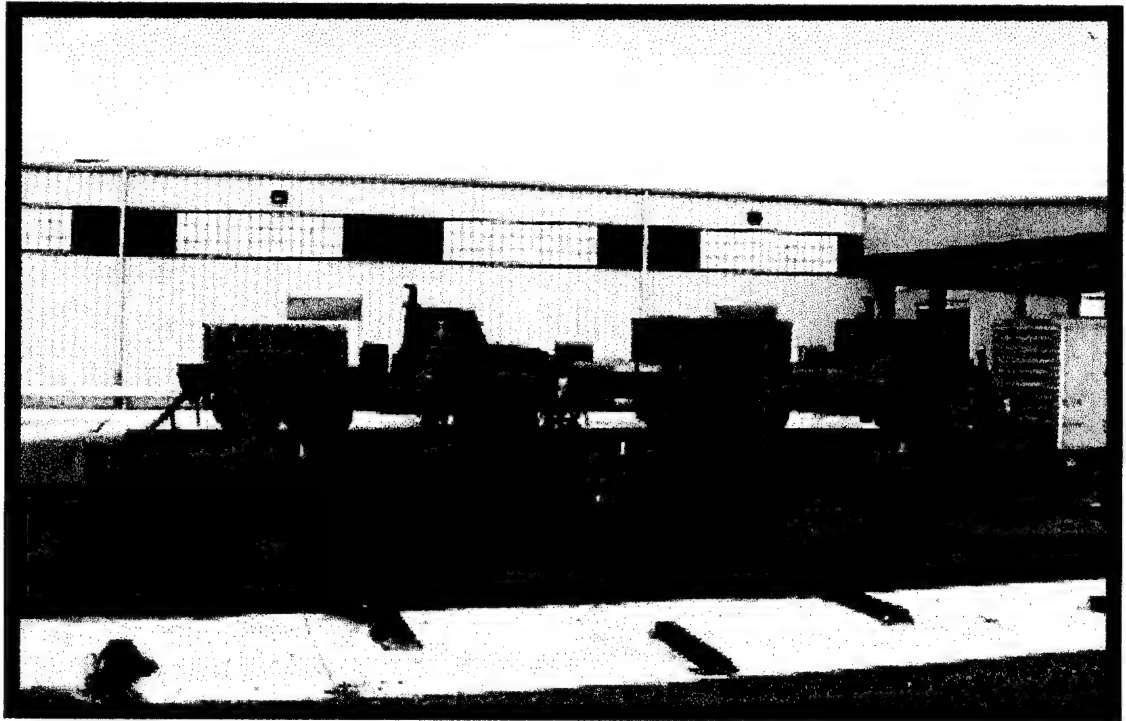
**5.4 TEST VEHICLE:** Truck, Cargo, 7-ton, w/o Winch (MK-27)

**Payload:** 120MM Tank Ammunition on metal pallets

**Payload Weight:** 15,900 pounds

**Date:** 29 February 2000 – 1 March 2000

**A. RAIL IMPACT**



**Rail impact test of MK-27 vehicle with 120MM Tank Ammunition**



DESCRIPTION	WEIGHT
Flatcar Number: DODX 40259	58,200 lbs.
MK25 (empty)	27,480 lbs.
155MM SLP Payload	14,120 lbs.
MK27 (empty)	28,700 lbs.
120MM Tank Ammunition	15,900 lbs.
Total Specimen Wt.	144,400 lbs.
Buffer Car (four cars)	250,000 lbs.

Impact Number	Velocity (mph)	Remarks
1	3.4	None
2	6.5	None
3	8.1	None
4	8.7	None

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.



## B. HAZARD COURSE



Hazard course test of MK-27 vehicle with 120MM Tank Ammunition

PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	26 Seconds	5.2
2	26 Seconds	5.2
3	25 Seconds	5.5
4	25 Seconds	5.5

**C. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

**D. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.



**Panic stop of MK-27 vehicle with 120MM Tank Ammunition**

**E. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.

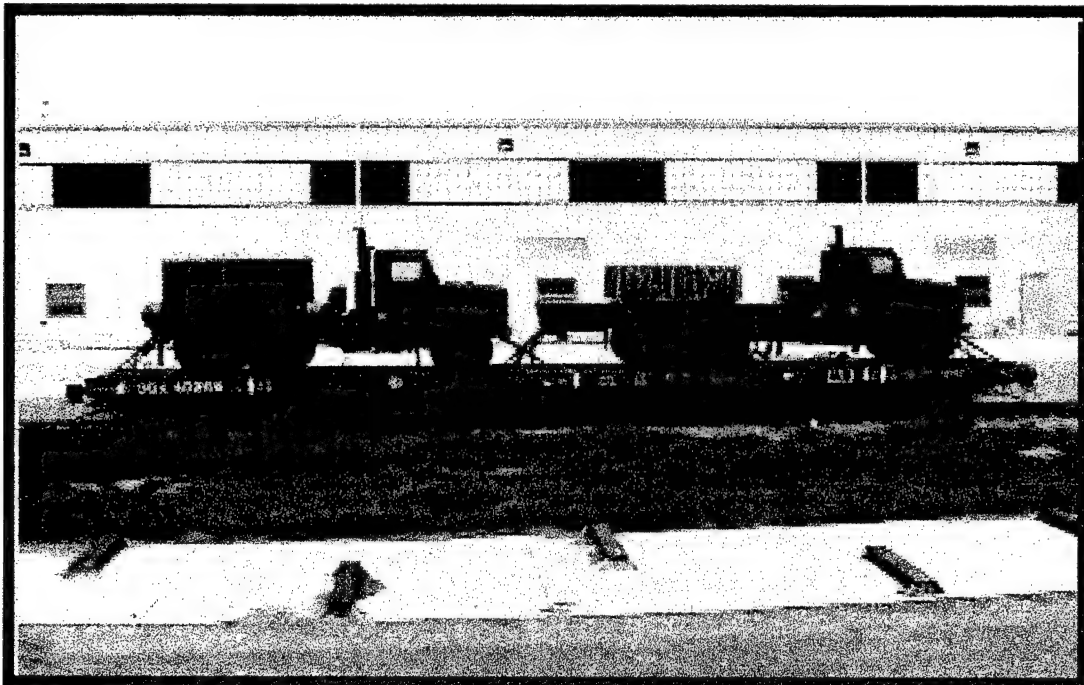
**5.5 TEST VEHICLE: Truck, Cargo, 7-ton, w/o Winch (MK-27)**

**Payload: 155MM Separate Loading Projectiles**

**Payload Weight: 14,120 pounds**

**Date: 14-15 March 2000**

**A. RAIL IMPACT DATA**



**Rail impact test of MK-27 vehicle with 120MM Tank Ammunition**

DESCRIPTION	WEIGHT
Flatcar Number: DODX 40259	58,200 lbs.
MK 25 (empty)	27,480 lbs.
120MM Tank Ammunition	15,500 lbs.
MK27 (empty)	28,700 lbs.
155MM SLP Payload	14,120 lbs.
Total Specimen Wt.	144,000 lbs.
Buffer Car (four cars)	250,000 lbs.

Impact Number	Velocity (mph)	Remarks
1	3.4	None
2	6.5	None
3	8.1	None
4	8.7	None

Remarks: No damage or failures occurred with the tiedown rings or the vehicle.

## B. HAZARD COURSE



**Hazard course test of MK-27 vehicle with 155MM  
Separate Loading Projectiles (SLPs)**

PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	26 Seconds	5.2
2	26 Seconds	5.2
3	25 Seconds	5.5
4	25 Seconds	5.5

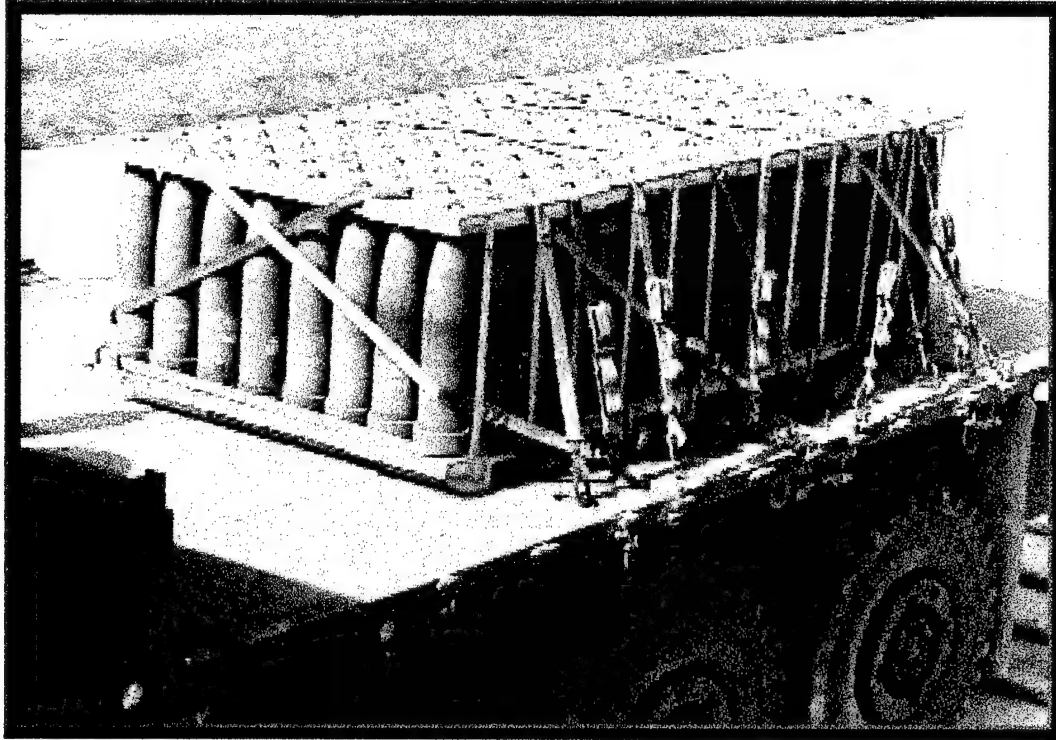
**C. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

**D. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.



**Panic stop of MK-27 vehicle with 155mm Separate Loading Projectiles**

**E. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.



**Washboard test of MK-27 vehicle with 155mm Separate Loading Projectiles**

**5.6 TEST VEHICLE:** Truck, Cargo, 7-ton, w/o Winch (MK-27)

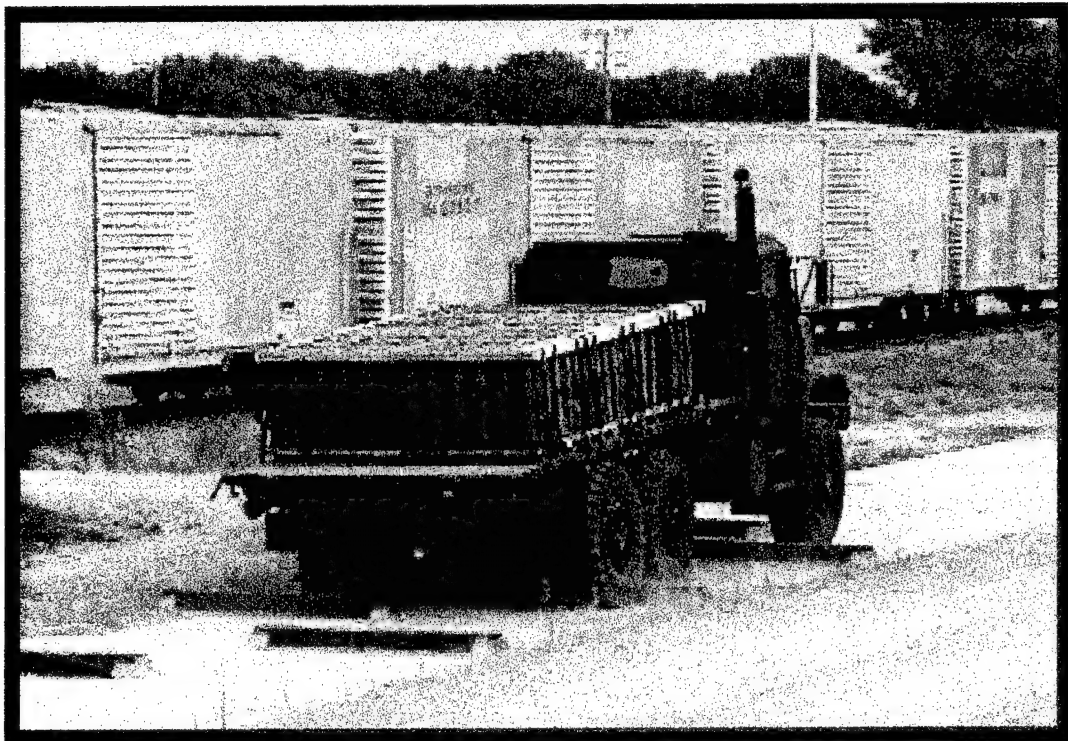
**Payload:** 155MM Separate Loading Projectiles

**Payload Weight:** 32,000 pounds

**Date:** 5 September 2000



## A. HAZARD COURSE



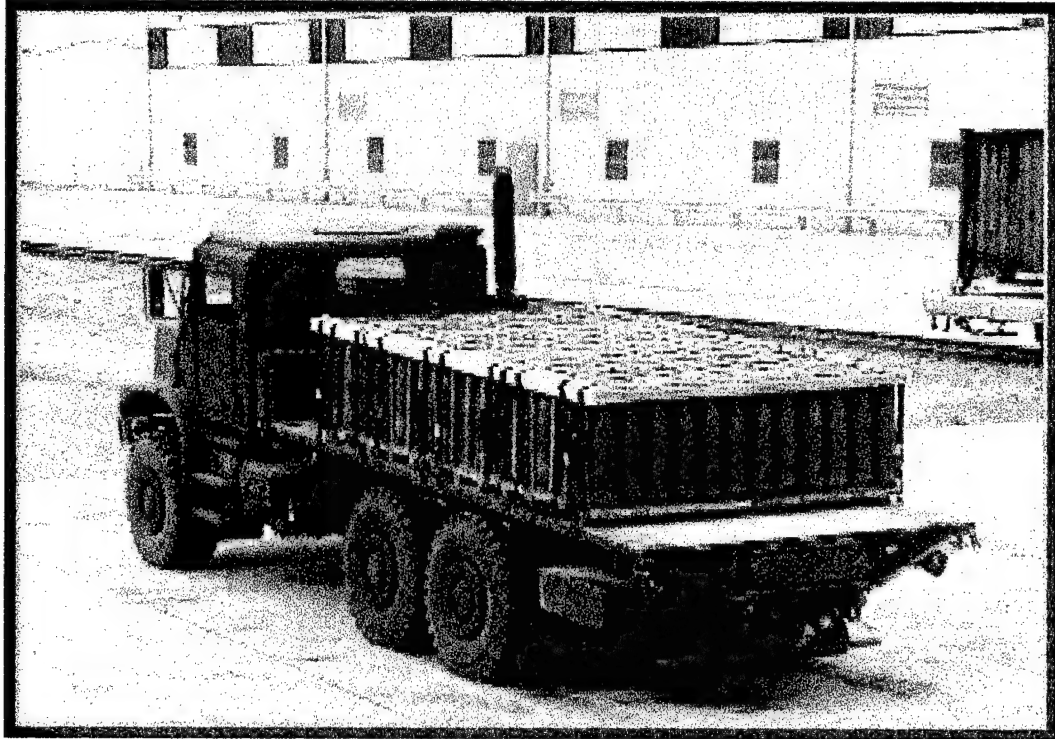
**Hazard course test of MK-27 vehicle with 32,000-pound payload**

PASS NO.	ELAPSED TIME	VELOCITY (MPH)
1	23 Seconds	5.9
2	24 Seconds	5.7
3	23 Seconds	5.9
4	23 Seconds	5.9

**B. ROAD TRIP:** No damage or failures occurred with the tiedown rings or the vehicle.

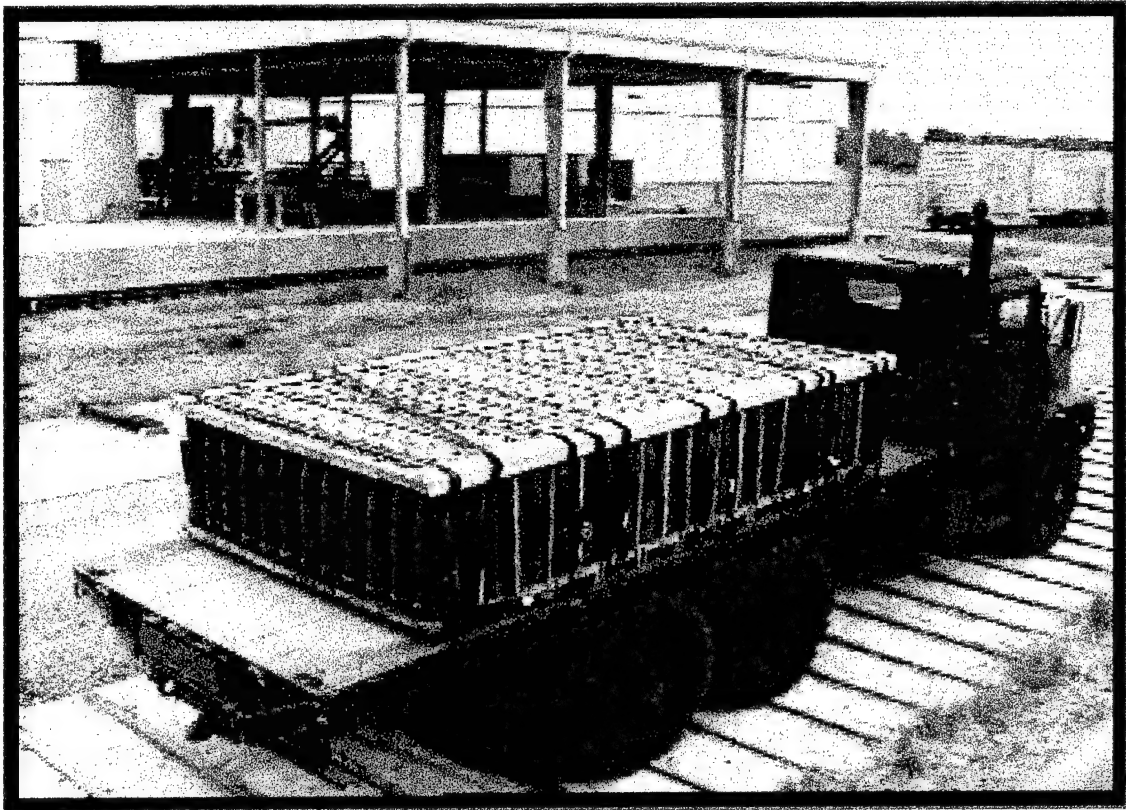


**C. PANIC STOPS:** No damage or failures occurred with the tiedown rings or the vehicle.



**Panic stop of MK-27 vehicle with 32,000-pound payload**

**D. WASHBOARD:** No damage or failures occurred with the tiedown rings or the vehicle.



**Washboard test of MK-27 vehicle with 32,000-pound payload**

## **PART 6 - DRAWINGS**

## **TEST SKETCH**

# **LOADING AND TIEDOWN<sup>•</sup> PROCEDURES FOR AMMUNITION ITEMS LOADED ON THE MTVR-STD AND MTVR-XL**

• NOTE: THE AMMUNITION TIEDOWN PROCEDURES CONTAINED WITHIN THIS DOCUMENT ARE TYPICAL. THE DEPICTED ITEMS ARE REPRESENTATIVE OF THE VARIOUS TYPES OF AMMUNITION THAT MAY BE RESTRAINED AND TRANSPORTED ON THE MTVR-STD AND MTVR-XL. THESE PROCEDURES WERE USED IN SUPPORT OF THE MTVR AMMUNITION CERTIFICATION TRANSPORTABILITY TEST PROGRAM.

Prepared during April 2001 by:  
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Gregory L. Willis  
Acting Chief,  
Transportation Engineering Division

#### GENERAL NOTES

- A. WEB STRAP TIEDOWN ASSEMBLIES MUST BE SECURELY HOOKED INTO ANCHORING DEVICES ON THE TRANSPORTING VEHICLE AND FIRMLY TENSIONED. FIRMLY TENSIONED MEANS, WHEN THE OPERATOR PULLS ON THE RATCHET HANDLE BY HAND, THE RATCHET WILL NOT ADVANCE ANOTHER NOTCH. NO TYPE OF MECHANICAL EXTENSION OR LEVER WILL BE USED. EXERCISE CARE DURING STRAP APPLICATION. AVOID TWISTS IN THE STRAP TO THE EXTENT POSSIBLE (IF TIME PERMITS) BUT ENSURE THERE ARE NO KNOTS IN THE STRAP. ON THE TAKE-UP SPOOL OF THE RATCHET, ENSURE STRAIGHT LAY OF THE STRAP WHEN TENSIONING. AFTER INITIAL WEBBING-TO-WEBBING CONTACT HAS BEEN MADE, BY ROTATING THE TAKE-UP SPOOL UNTIL NO METAL ON THE SPOOL IS SHOWING AND THE STRAP HAS MADE CONTACT WITH ITSELF. THE TENSIONED STRAP MUST FORM AT LEAST 1/2 BUT NOT MORE THAN 1-1/2 WRAPS OF STRAP ON THE TAKE-UP SPOOL OF THE TENSIONING RATCHET. AFTER TENSIONING IS COMPLETED, ENSURE THAT THE SPOOL LOCKING LATCH IS FULLY SEATED AT BOTH ENDS OF THE SPOOL IN MATCHING LOCKING NOTCHES. TIE BACK THE LOOSE END OF THE STRAP AFTER TENSIONING IS COMPLETED (LOOSE ENDS MAY BE FOLDED AND TAPED OR TIED TO THE TENSIONING STRAP IF TIME PERMITS).
- B. ADJUSTABLE SCUFF SLEEVES PROVIDED ON WEB STRAP ASSEMBLIES WILL BE LOCATED TO PROVIDE A PAD WHERE STRAPS PASS OVER SHARP EDGES, OR RATCHETS AND HOOKS ON PREVIOUSLY INSTALLED WEB STRAP TIEDOWN ASSEMBLIES.
- C. A STAGGERED NAILING PATTERN WILL BE USED WHENEVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.
- D. THE WEB STRAP RATCHETS SHOULD BE PLACED SYMMETRICALLY AROUND THE LOAD. FOR EXAMPLE, THE RATCHET FOR ONE STRAP ASSEMBLY SHOULD BE POSITIONED ON ONE SIDE OF THE VEHICLE AND THE RATCHET OF THE CORRESPONDING STRAP ASSEMBLY SHOULD BE POSITIONED ON THE OPPOSITE SIDE OF THE VEHICLE.

#### MATERIAL SPECIFICATIONS

LUMBER - - - - - : SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.

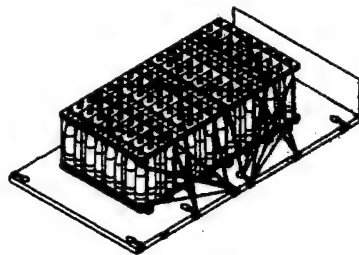
NAILS - - - - - : ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMS).

STRAPPING, STEEL - - : ASTM D3953; FLAT STRAPPING, TYPE 1, HEAVY DUTY, FINISH A, B (GRADE 2), OR C.

STRAP - - - - - : WEBBING, UNIVERSAL TIEDOWN, NSN 5340-01-204-3009, PN9392419, OR NSN 5340-01-089-4997, PNL1669888, OR NSN 1670-00-725-1437, PNL376-013, OR NSN 5340-00-980-9277, PNL0900880.

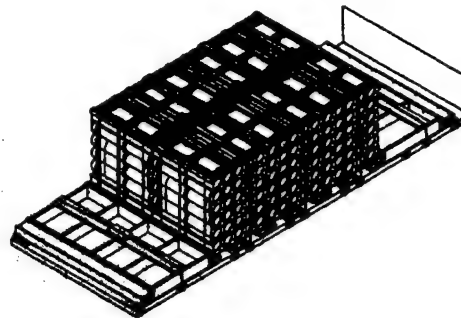
SEAL, STRAP - - - - : ASTM D3953; CLASS H, FINISH A, B (GRADE 2), OR C, DOUBLE NOTCH TYPE, STYLE I, II, OR IV.

PAGE 2



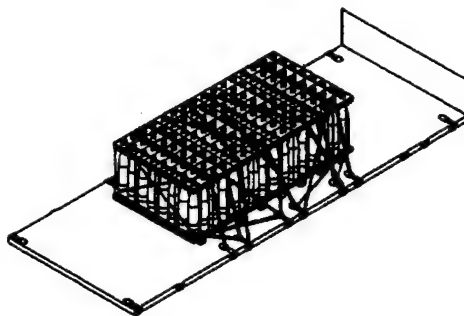
**155MM SLP TEST LOAD FOR THE MTVR-STD**

16 WEB STRAPS, SEE PAGES 4 AND 5  
(RAIL IMPACT AND ROAD TESTS)



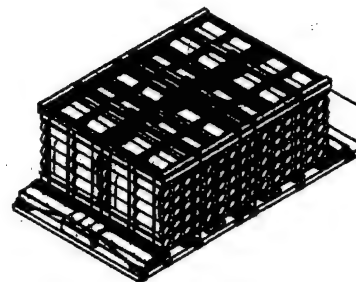
**120MM TEST LOAD FOR THE MTVR-XL**

WOODEN DUNNAGE AND STEEL STRAPPING,  
SEE PAGE 6 (RAIL IMPACT AND ROAD TESTS)



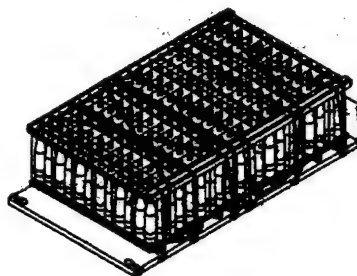
**155MM SLP TEST LOAD FOR THE MTVR-XL**

14 WEB STRAPS, SEE PAGES 7, 8, AND 9  
(RAIL IMPACT AND ROAD TESTS)



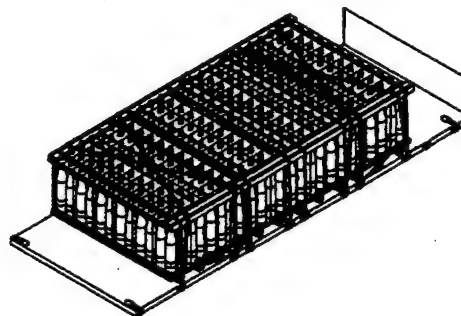
**120MM TEST LOAD FOR THE MTVR-STD**

WOODEN DUNNAGE AND STEEL STRAPPING,  
SEE PAGE 10 (RAIL IMPACT AND ROAD TESTS)



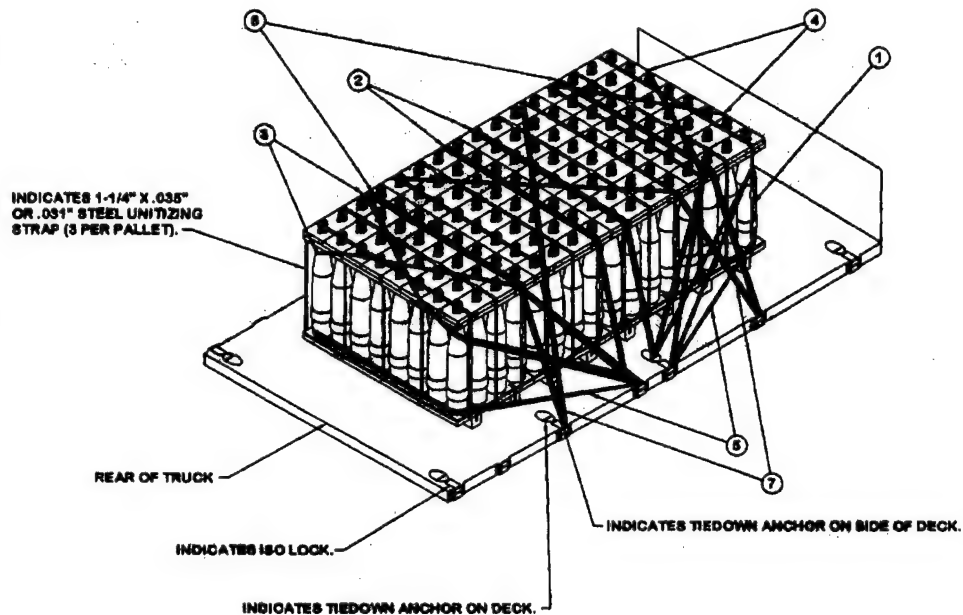
**30,000 POUND TEST LOAD FOR THE MTVR-STD**

12 WEB STRAPS AND WOODEN DUNNAGE,  
SEE PAGE 14 AND 15 (ROAD TESTS ONLY)



**30,000 POUND TEST LOAD FOR THE MTVR-XL**

14 WEB STRAPS AND WOODEN DUNNAGE, SEE  
PAGES 11, 12, AND 13 (ROAD TESTS ONLY)



**ISOMETRIC VIEW**

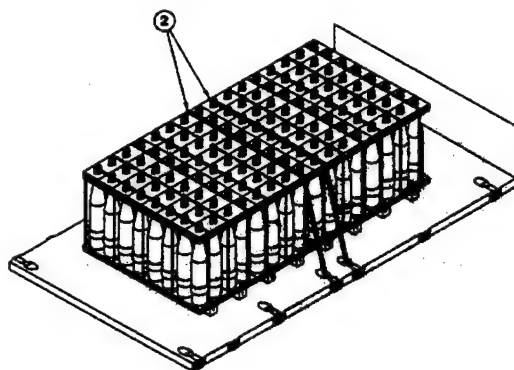
**KEY NUMBERS \***

- ① STEEL BUNDLING STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT (3 REQD). BUNDLE 4 PALLETS WITH 2 STRAPS. SEAL EACH STRAP WITH ONE SEAL, CRIMPED WITH TWO PAIR OF NOTCHES.
- ② WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ③ WEB STRAP TIEDOWN ASSEMBLY (4 REQD). THIS ASSEMBLY CONSISTS OF TWO SETS OF TWO STRAPS WITH ONE SET PLACED ON TOP OF THE OTHER SET.
- ④ WEB STRAP TIEDOWN ASSEMBLY (4 REQD). THIS ASSEMBLY CONSISTS OF TWO SETS OF TWO STRAPS WITH ONE SET PLACED ON TOP OF THE OTHER SET.
- ⑤ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑥ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑦ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).

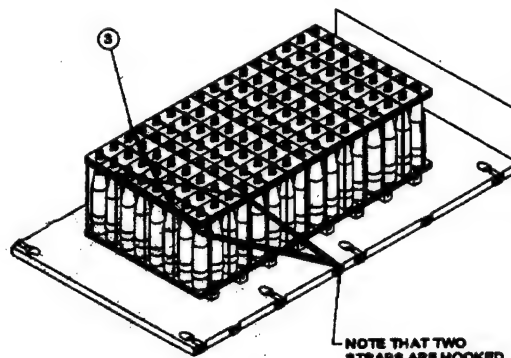
\* KEY NUMBERS ALSO INDICATE THE ORDER OF STRAP PLACEMENT, WHICH IS SHOWN ON PAGE 5.

**TEST LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	16	13,984 LBS

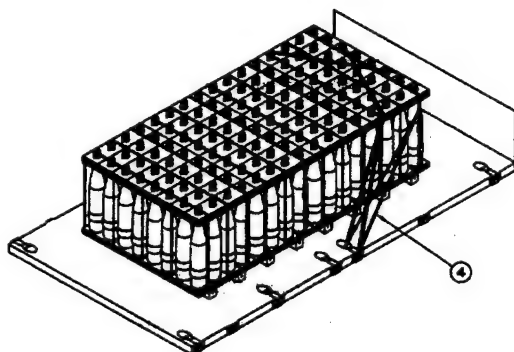


**STEP 1**  
(2 STRAPS)

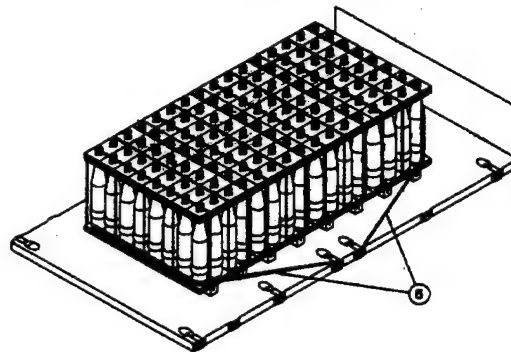


**STEP 2**  
(4 STRAPS)

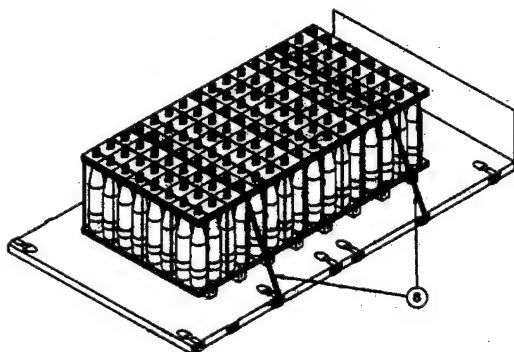
NOTE THAT TWO STRAPS ARE HOOKED TO THE INNER TIEDOWN ANCHOR AND TWO TO THE OUTER ANCHOR.



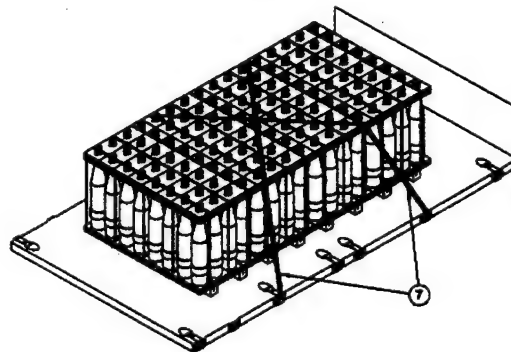
**STEP 3**  
(4 STRAPS)



**STEP 4**  
(2 STRAPS)



**STEP 5**  
(2 STRAPS)

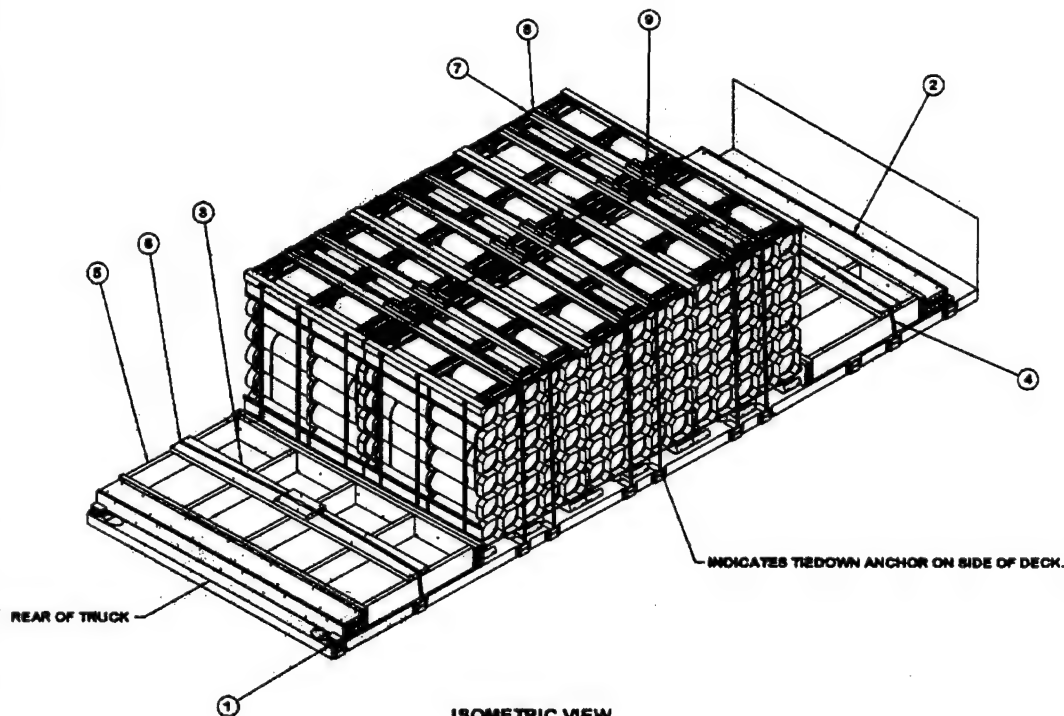


**STEP 6**  
(2 STRAPS)

**TIEDOWN STRAP PLACEMENT ORDER FOR 15MM SLP TEST LOAD ON MTVR-STD**

**PAGE 5**





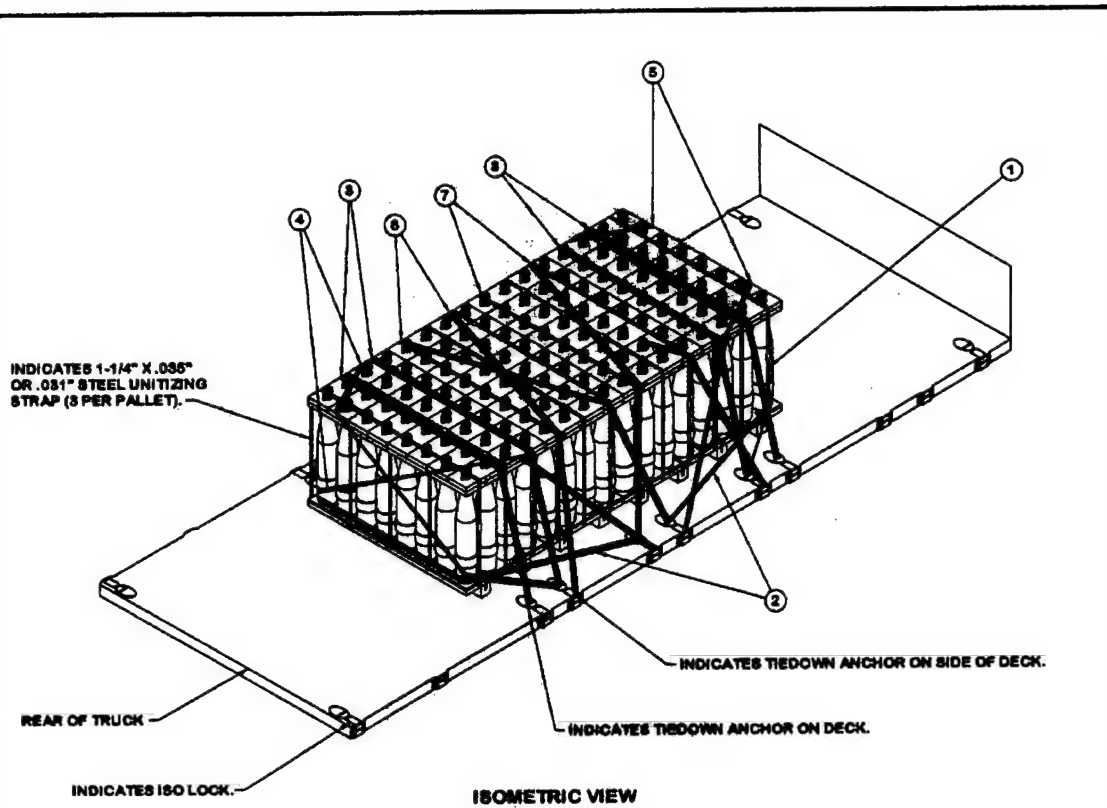
**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① THE REAR AND FORWARD ISO LOCK PAIRS MUST BE IN THE LOCKED POSITION.
- ② FORWARD BLOCKING ASSEMBLY A (1 REQD). SEE THE DETAIL ON PAGE 18.
- ③ STRAPPING BOARD ASSEMBLY A (2 REQD). SEE THE DETAIL ON PAGE 18.
- ④ HOLD DOWN STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT STEEL STRAPPING (1 REQD).
- ⑤ REAR BLOCKING ASSEMBLY A (1 REQD). SEE THE DETAIL ON PAGE 18.
- ⑥ HOLD DOWN STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT STEEL STRAPPING (1 REQD).
- ⑦ STRAPPING BOARD ASSEMBLY B (8 REQD). SEE THE DETAIL ON PAGE 18.
- ⑧ HOLD DOWN STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT STEEL STRAPPING (8 REQD).
- ⑨ SEAL FOR 1/4" STRAPPING (8 REQD). CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES.

**TEST LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	6	14,760 LBS
DUNNAGE		525 LBS
TOTAL WEIGHT		15,285 LBS (APPROX)



**ISOMETRIC VIEW**

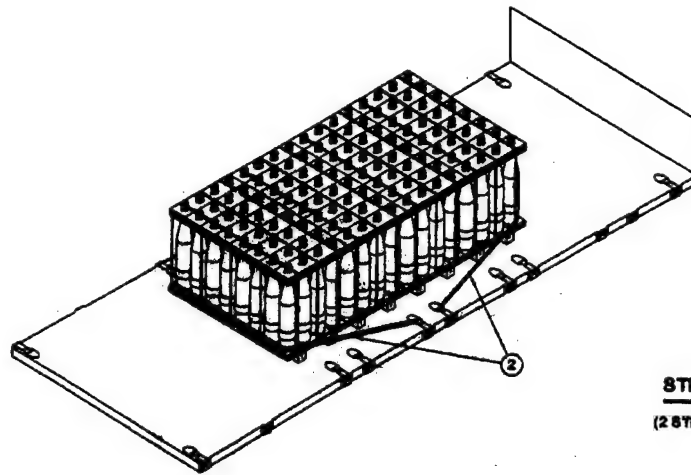
**KEY NUMBERS \***

- ① STEEL BUNDLING STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT (8 REQD). BUNDLE 3 OF 4 PALLETS IN EACH ROW WITH TWO STRAPS. SEAL EACH STRAP WITH ONE SEAL CRIMPED WITH TWO PAIR OF NOTCHES.
- ② WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ③ WEB STRAP TIEDOWN ASSEMBLY (4 REQD).
- ④ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑤ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑥ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑦ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).

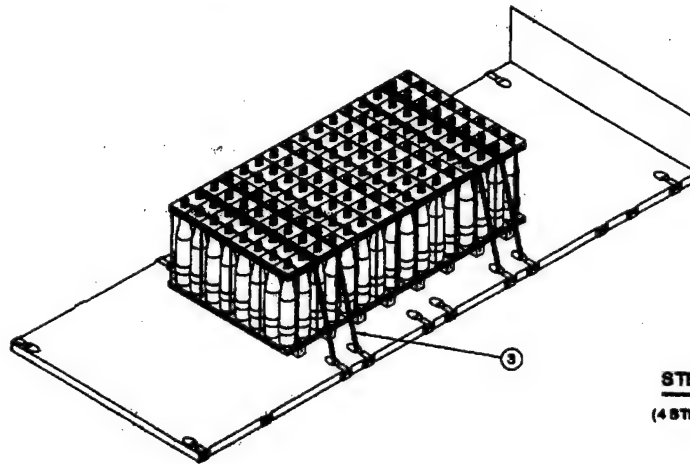
\* KEY NUMBERS ALSO INDICATE THE ORDER OF STRAP PLACEMENT, WHICH IS SHOWN ON PAGES 8 AND 9.

**TEST LOAD AS SHOWN**

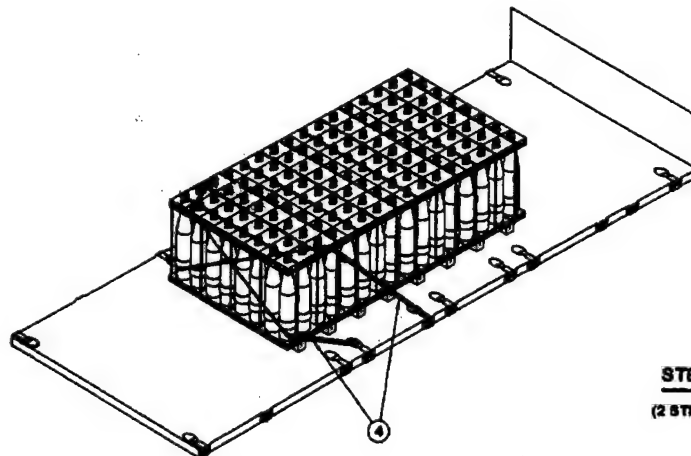
ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	16	13,984 LBS



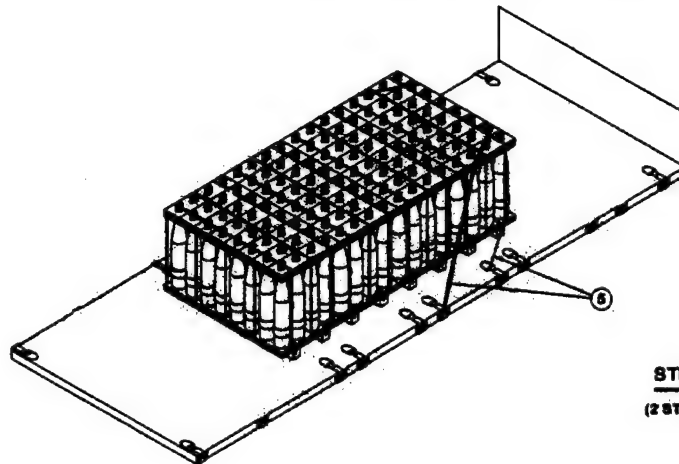
**STEP 1**  
(2 STRAPS)



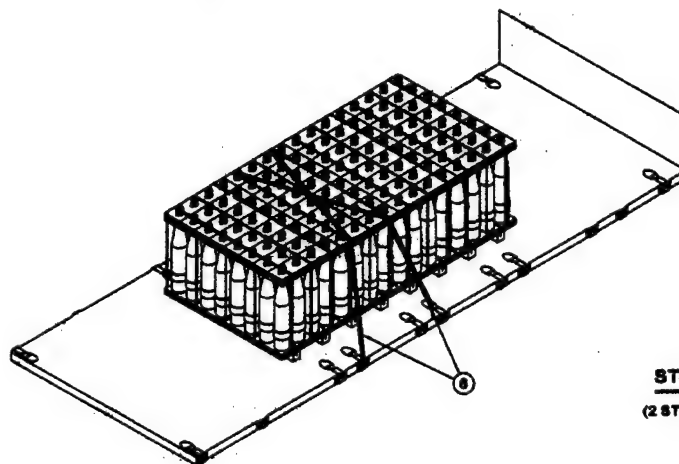
**STEP 2**  
(4 STRAPS)



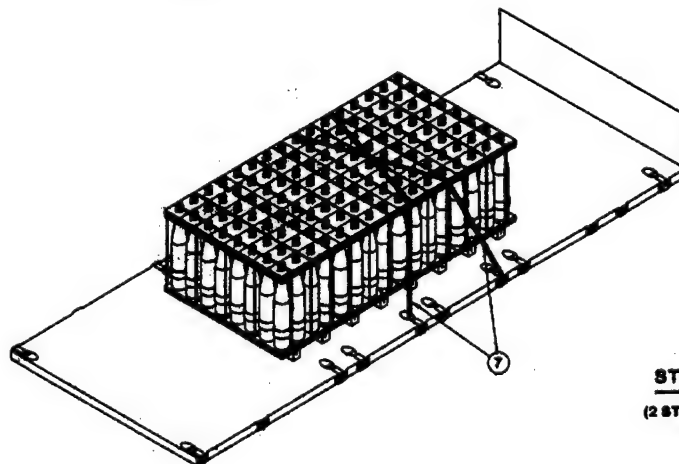
**STEP 3**  
(2 STRAPS)



**STEP 4**  
(2 STRAPS)



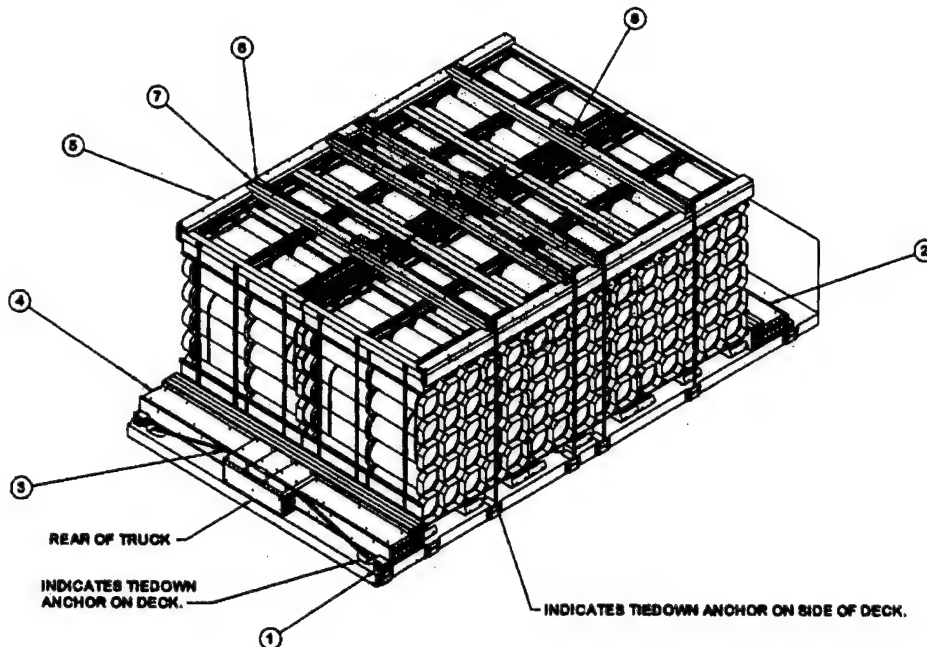
**STEP 5**  
(2 STRAPS)



**STEP 6**  
(2 STRAPS)

**TIEDOWN STRAP PLACEMENT ORDER FOR 154MM SLP TEST LOAD ON MTVR-XL**

**PAGE 9**



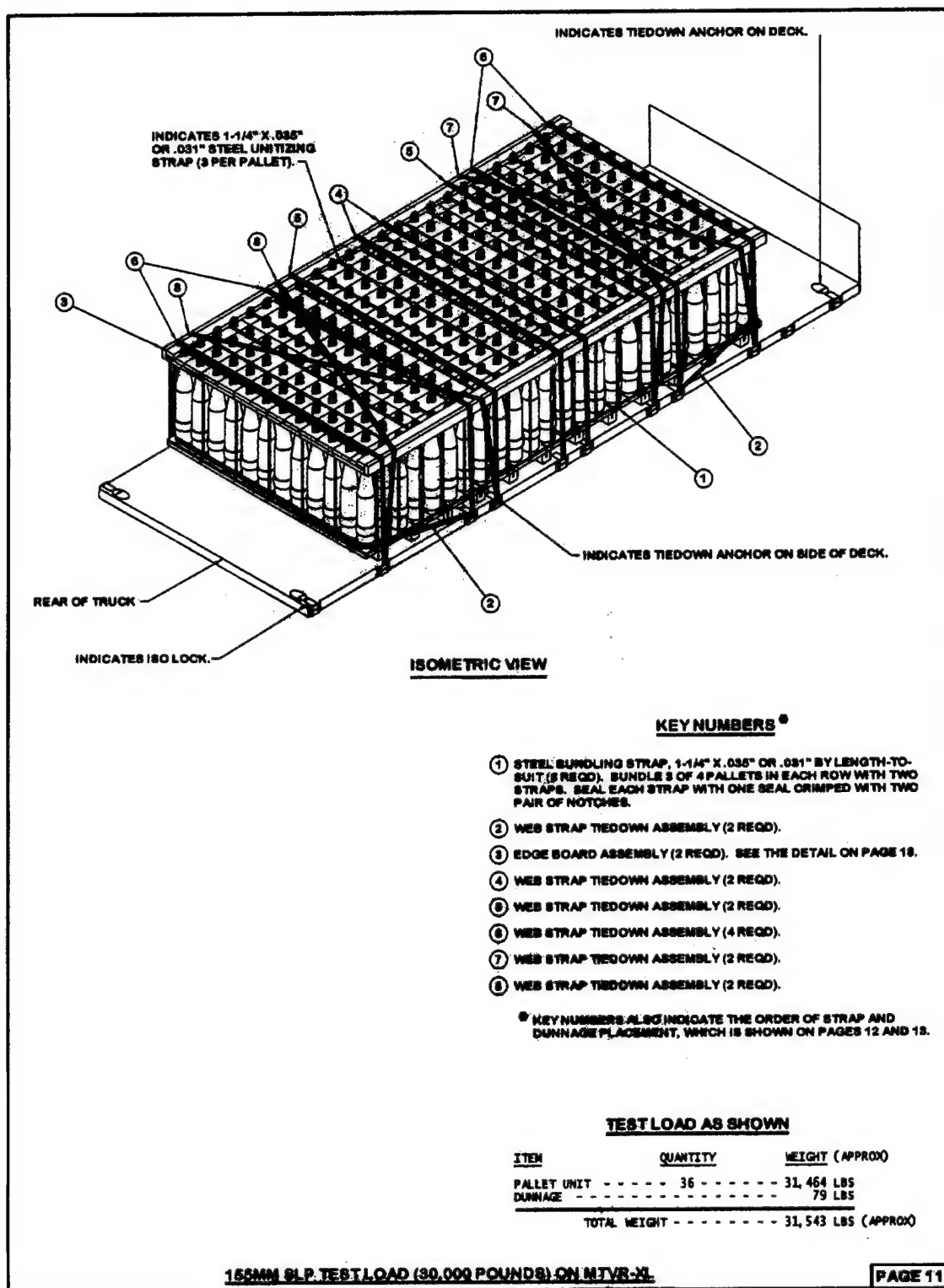
**ISOMETRIC VIEW**

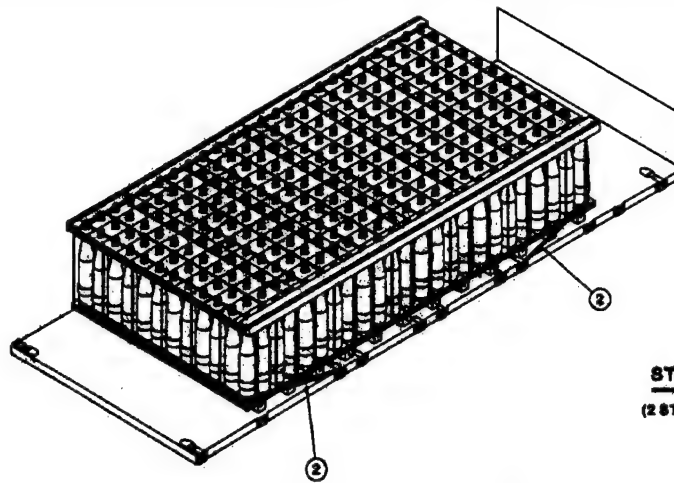
**KEY NUMBERS**

- ① THE REAR AND FORWARD ISO LOCK PAIRS MUST BE IN THE LOCKED POSITION.
- ② FORWARD BLOCKING ASSEMBLY B (1 REQD). SEE THE DETAIL ON PAGE 17.
- ③ HOLD DOWN STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT STEEL STRAPPING (2 REQD, 1 FORWARD AND 1 REAR). THE FORWARD HOLD DOWN STRAP (NOT SHOWN, BUT PLACEMENT IS IDENTICAL TO THE REAR HOLD DOWN STRAP) MUST BE TIGHTENED AND SEALED OVER THE FORWARD BLOCKING ASSEMBLY BEFORE THE LOAD IS PLACED ON THE MTVR-STD.
- ④ REAR BLOCKING ASSEMBLY B (1 REQD). SEE THE DETAIL ON PAGE 17.
- ⑤ EDGE BOARD ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 18.
- ⑥ STRAPPING BOARD ASSEMBLY C (4 REQD). SEE THE DETAIL ON PAGE 18.
- ⑦ HOLD DOWN STRAP, 1-1/4" X .035" OR .031" BY LENGTH-TO-SUIT STEEL STRAPPING (4 REQD).
- ⑧ SEAL FOR 1/4" STRAPPING (8 REQD). CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES.

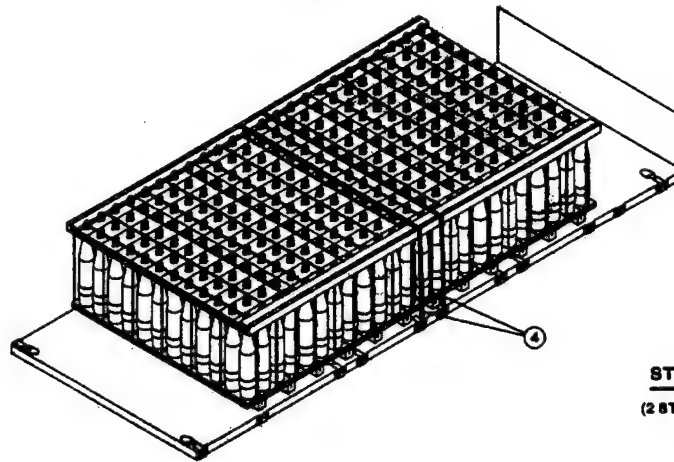
**TEST LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	6	14,760 LBS
DUNNAGE		506 LBS
TOTAL WEIGHT		15,266 LBS (APPROX)

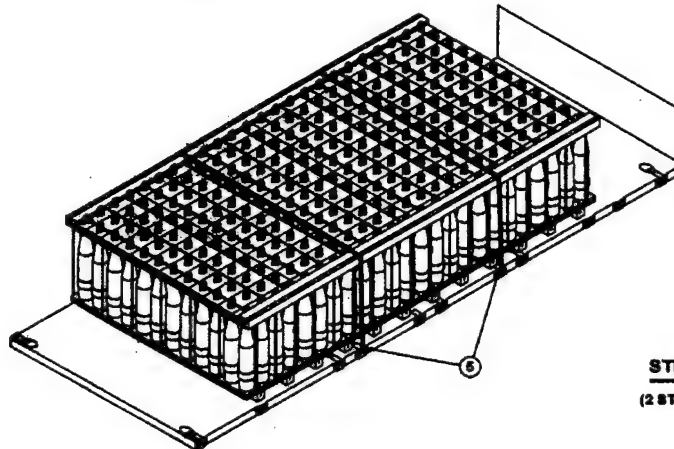




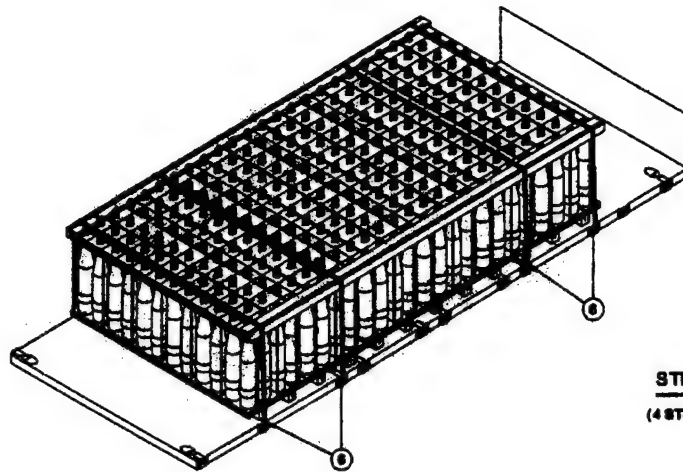
**STEP 1**  
(2 STRAPS)



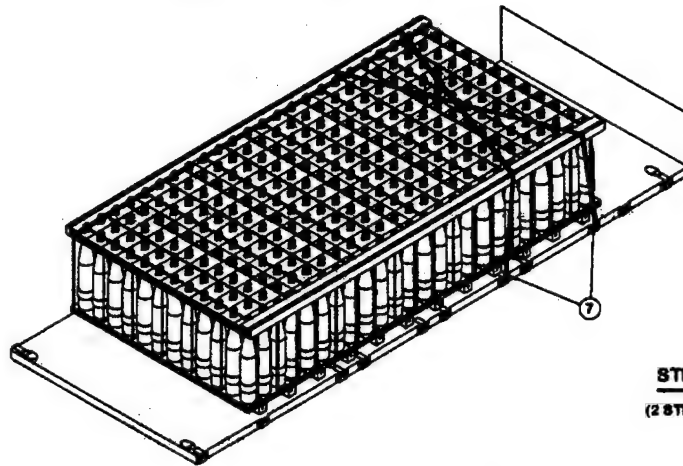
**STEP 2**  
(2 STRAPS)



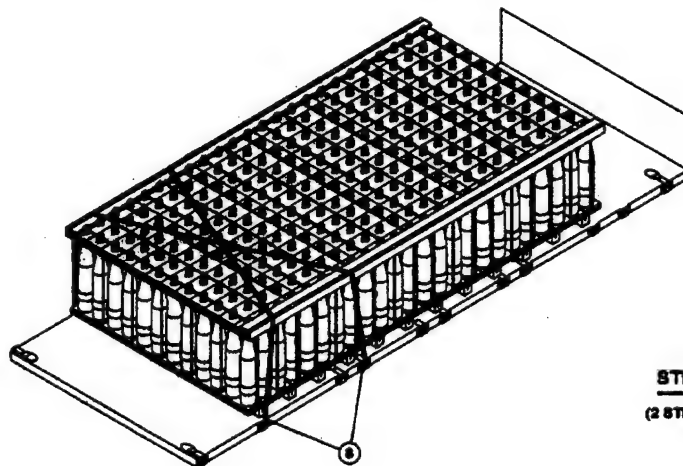
**STEP 3**  
(2 STRAPS)



**STEP 4**  
(4 STRAPS)



**STEP 5**  
(2 STRAPS)

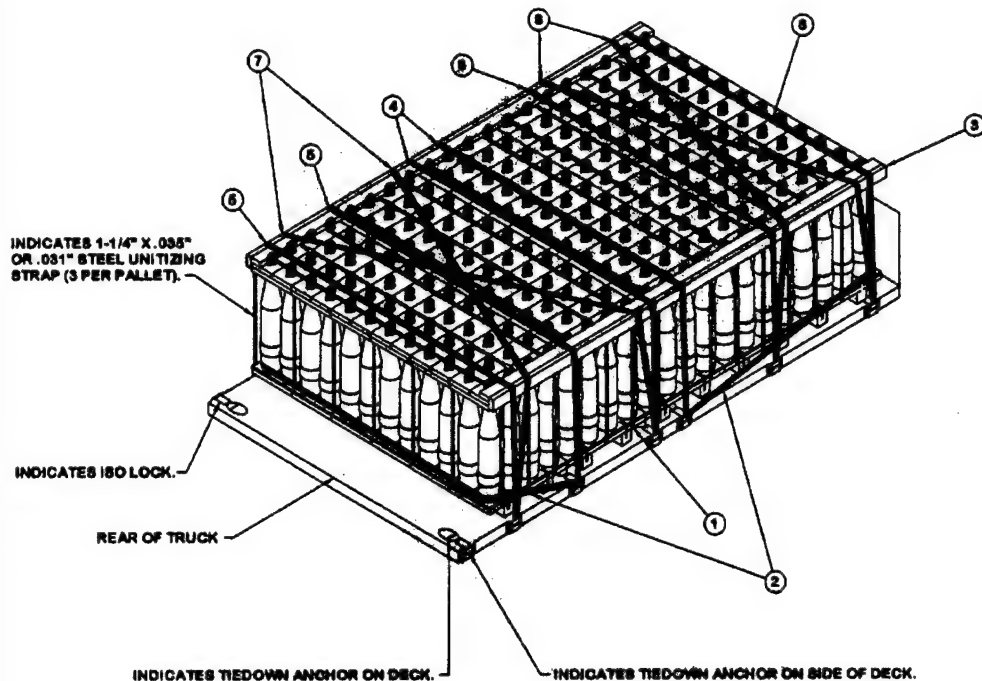


**STEP 6**  
(2 STRAPS)

**TIEDOWN STRAP PLACEMENT ORDER FOR 30,000 POUND TEST LOAD ON MTVR-XL**

**PAGE 13**





**ISOMETRIC VIEW**

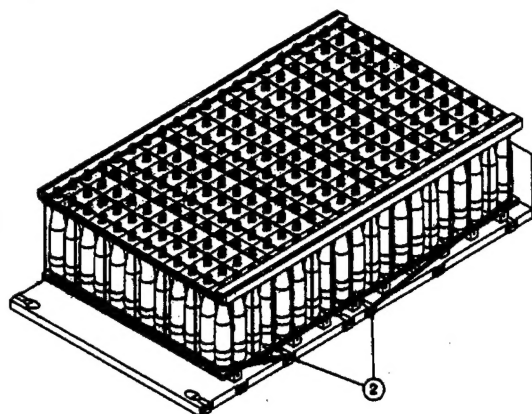
**KEY NUMBERS \***

- ① STEEL BUNDLING STRAP, 1-1/4" X .035" OR .031" (6 REQD). BUNDLE 4 PALLETS WITH 2 STRAPS. SEAL EACH STRAP WITH ONE SEAL CRIMPED WITH TWO PAIR OF NOTCHES.
- ② WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ③ EDGE BOARD ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 18.
- ④ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑤ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑥ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑦ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).
- ⑧ WEB STRAP TIEDOWN ASSEMBLY (2 REQD).

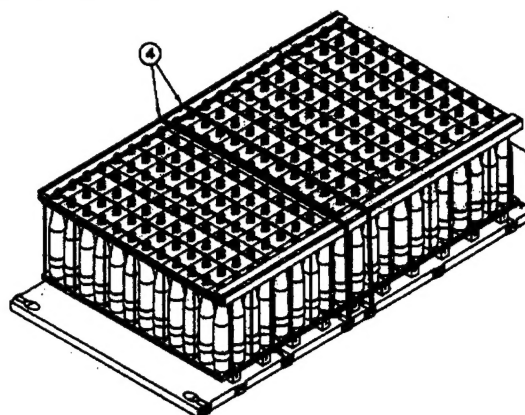
\* KEY NUMBERS ALSO INDICATE THE ORDER OF STRAP PLACEMENT, WHICH IS SHOWN ON PAGE 5.

**TEST LOAD AS SHOWN**

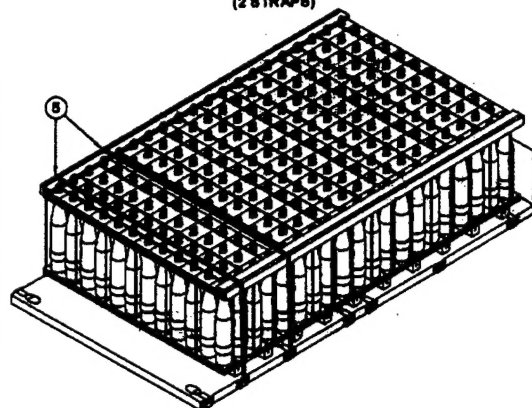
ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	30	26,220 LBS
DUNNAGE		65 LBS
TOTAL WEIGHT		26,285 LBS (APPROX)



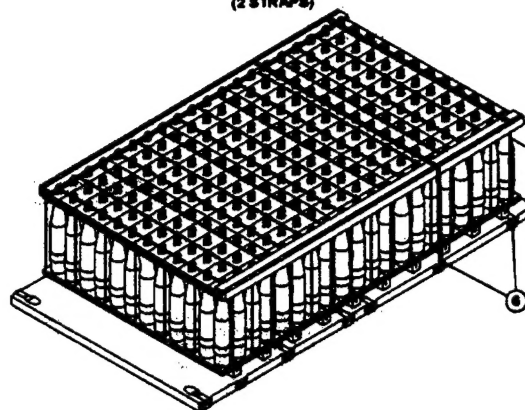
**STEP 1**  
(2 STRAPS)



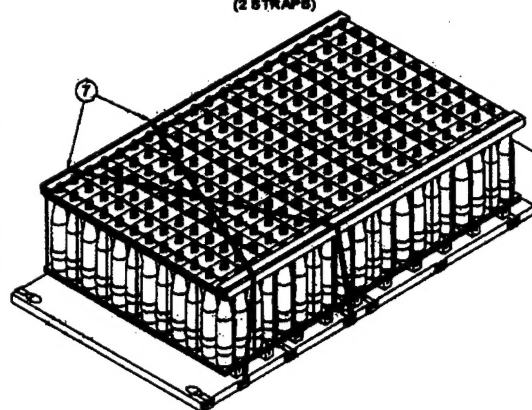
**STEP 2**  
(2 STRAPS)



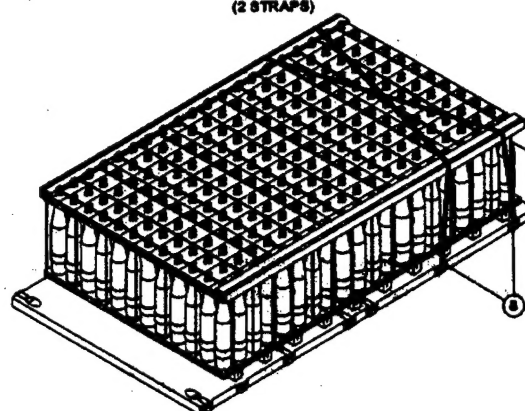
**STEP 3**  
(2 STRAPS)



**STEP 4**  
(2 STRAPS)



**STEP 5**  
(2 STRAPS)



**STEP 6**  
(2 STRAPS)

**TIEDOWN STRAP PLACEMENT ORDER FOR 30,000 POUND TEST LOAD ON MTVR-STD**

**PAGE 15**

STRUT, 2" X 8" X 40-3/4" (5 REQD). PLACE THE OUTSIDE EDGE OF THE OUTER STRUTS AT 3/4" FROM THE ENDS OF THE BEARING PIECES.

BEAM ASSEMBLY, 2" X 8" X 7'-8" (QUADRUPLED) (1 REQD). LAMINATE PIECES TOGETHER W/14-10d NAILS PER LAMINATION. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN, WITH 2 NAILS IN LINE WITH EACH OTHER AT EACH END.

22-1/4" (4 PLACES)

BEARING PIECE, 2" X 8" X 7'-8" (2 REQD). NAIL TO THE STRUTS W/12-10d NAILS AT EACH JOINT.

SPACER PIECE, 1" X 4-7/8" (ACTUAL) X 7'-8-3/4" (1 REQD). NAIL TO BEAM ASSEMBLY W/11-10d NAILS. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN.

POSITION THIS SIDE OF THE BLOCKING ASSEMBLY AGAINST THE FORWARD ISO LOCKS, WHICH MUST BE IN THE LOCKED POSITION.

SPACER PIECE, 2" X 8" X 7'-8" (1 REQD). LAMINATE TO THE BEARING PIECE W/12-10d NAILS. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN.

NAIL BEARING PIECE TO BEAM ASSEMBLY W/12-10d NAILS. PLACE 3 NAILS IN EACH BAY BETWEEN STRUTS, EVENLY SPACED, AND IN A STAGGERED PATTERN.

#### FORWARD BLOCKING ASSEMBLY A

(USED IN LOAD ON PAGE 6)

BEAM ASSEMBLY, 2" X 8" X 7'-8" (QUADRUPLED) (1 REQD). LAMINATE PIECES TOGETHER W/14-10d NAILS PER LAMINATION. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN, WITH 2 NAILS IN LINE WITH EACH OTHER AT EACH END.

STRUT, 2" X 8" BY CUT TO FIT (5 REQD). PLACE THE OUTSIDE EDGE OF THE OUTER STRUTS AT 3/4" FROM THE ENDS OF THE BEARING PIECES.

22-1/4" (4 PLACES)

SPACER PIECE, 1" X 4-7/8" (ACTUAL) X 7'-8-3/4" (1 REQD). NAIL TO BEAM ASSEMBLY W/11-10d NAILS. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN.

SPACER PIECE, 2" X 8" X 7'-8" (1 REQD). LAMINATE TO THE BEARING PIECE W/12-10d NAILS. SPACE NAILS AT 8" TO 10" IN A STAGGERED PATTERN.

BEARING PIECE, 2" X 8" X 7'-8" (2 REQD). NAIL TO THE STRUTS W/12-10d NAILS AT EACH JOINT.

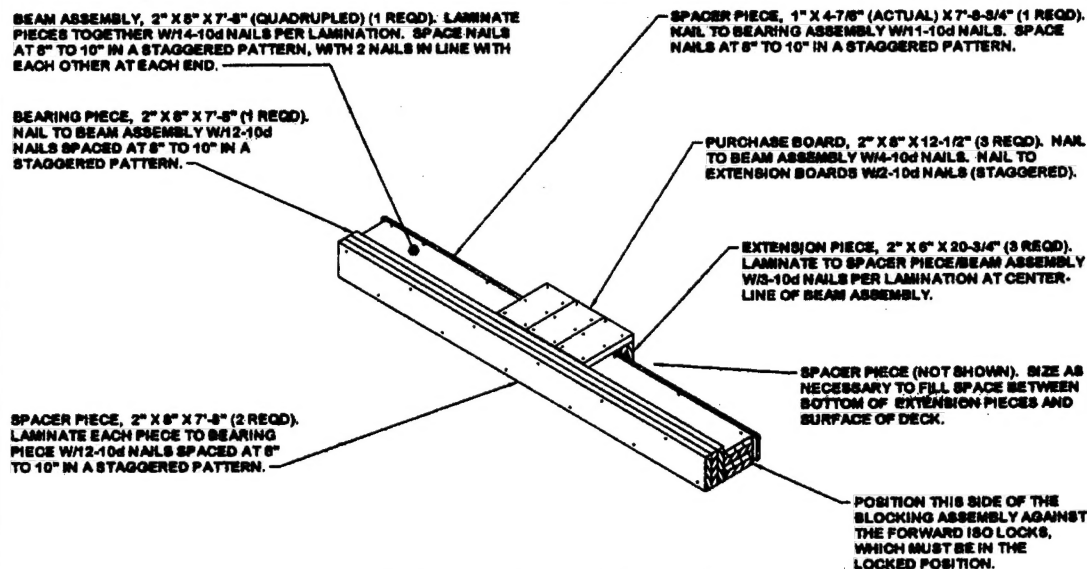
NAIL BEARING PIECE TO BEAM ASSEMBLY W/12-10d NAILS. PLACE 3 NAILS IN EACH BAY BETWEEN STRUTS, EVENLY SPACED, AND IN A STAGGERED PATTERN.

FABRICATE TO FIT TIGHTLY BETWEEN THE REAR ISO LOCKS AND THE AMMO PALLETS.

POSITION THIS SIDE OF THE BEARING ASSEMBLY AGAINST THE REAR ISO LOCKS, WHICH MUST BE IN THE LOCKED POSITION.

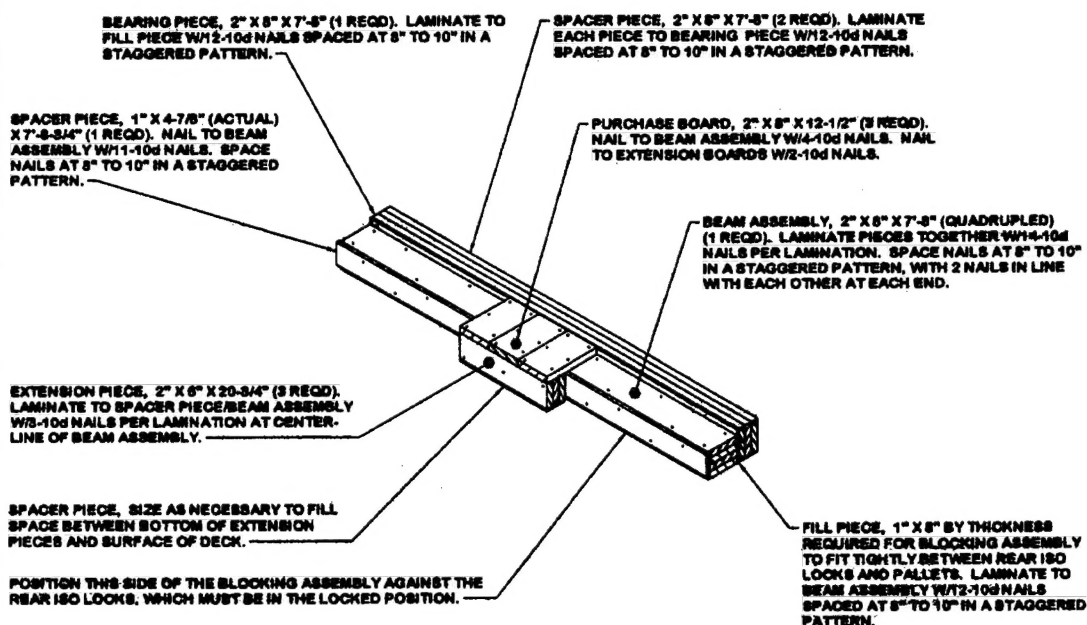
#### REAR BLOCKING ASSEMBLY A

(USED IN LOAD ON PAGE 6)



#### FORWARD BLOCKING ASSEMBLY B

(USED IN LOAD ON PAGE 10)

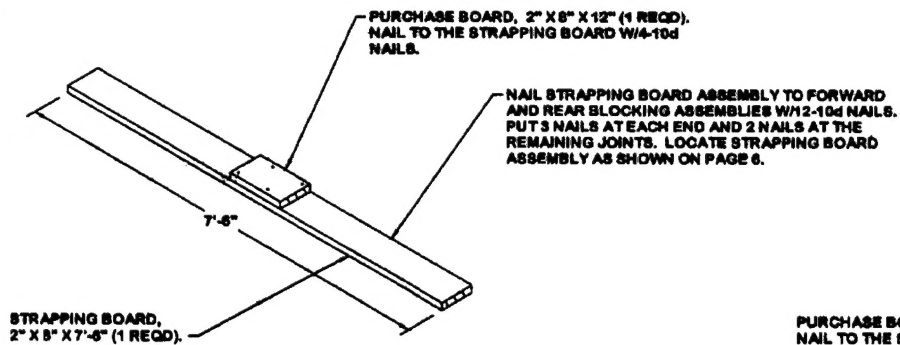


#### REAR BLOCKING ASSEMBLY B

(USED IN LOAD ON PAGE 10)

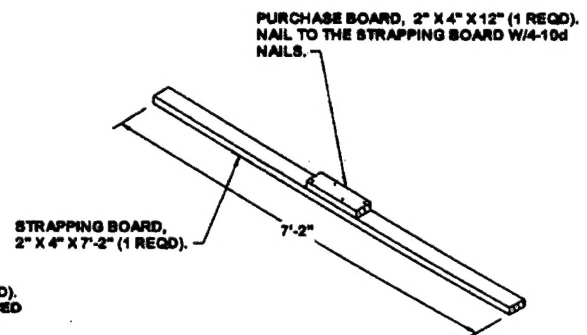
DETAILS

PAGE 17



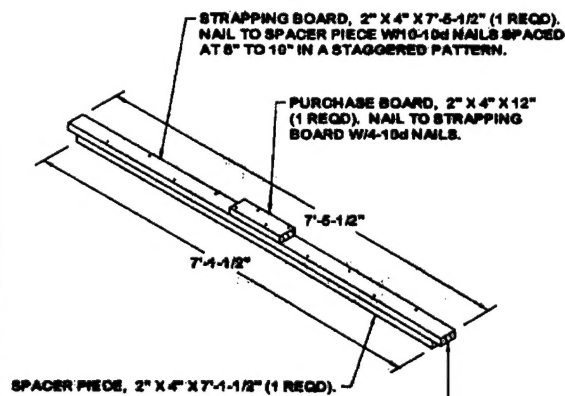
#### STRAPPING BOARD ASSEMBLY A

(USED IN LOAD ON PAGE 6)



#### STRAPPING BOARD ASSEMBLY B

(USED IN LOAD ON PAGE 6)

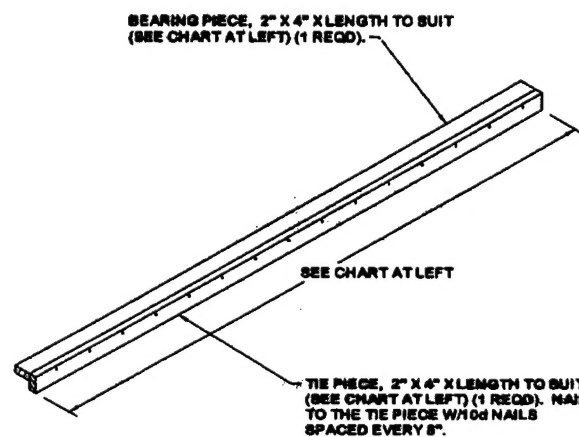


NAIL ONE END OF STRAPPING BOARD ASSEMBLY TO EDGE BOARD ASSEMBLY W/2-10d NAILS. TIGHTEN AND SEAL STRAP, THEN NAIL THE OTHER END OF ASSEMBLY TO THE OTHER EDGE BOARD W/2-10d NAILS.

#### STRAPPING BOARD ASSEMBLY C

(USED IN LOAD ON PAGE 10)

EDGE BOARD LENGTHS		
STD-185MB	10'-0"	PAGE 10
XL-90,000 LB	14'-8"	PAGE 11
STD-30,000 LB	12'-2"	PAGE 14



#### EDGE BOARD ASSEMBLY